ISTC Sniper Course

Handbook

Dated 24 May 2003

Index

Part 1 Mission planning (OPORD)

Part 2 Employment of snipers

Part 3 Individual camouflage and Concealment / Ghillie suits

Part 4 Advance rifle Marksmanship

Part 5 Sniper Marksmanship

Part 6 Sight Adjustment and Zero

Part 7 Application of Fire

Part 8 Correction for meteorological conditions / reading wind and spotting

Part 9 Judging distances / Range Estimation

Part 10 Snipers observation log and snipers range card / Panoramic sketching

Part 11 Observation of ground

Part 12 Individual movement / Selecting lines of advance

Part 13 Sniper hides and loopholes

Part 14 Tracking / counter tracking

Part 15 Sniper / Observer Dialog

Part 16 Introduction to NVG (optional)

Part 17 Alternate SWS (optional)

Part 18 Urban Sniper

Part 19 ISTC Sniper Course References / Sniper Schools and Units

Part 20 Data Book

Part 21 Range Cards

Dated 23.March 2003

Part 1

Mission Planning

(OPORD)

SNIPER MISSION PLANNING AND PREPARATION

Planning and coordination are essential procedures that occur during the preparation phase of a mission. Successful accomplishment of a Sniper Mission relates directly to the planning and preparation that takes place.

Special operations sniper employment is complex. When employed intelligently, skillfully, and with originality, the sniper will provide a pay-off far greater than would be expected from the assets used. For this to happen, though, the planner must have more than a basic knowledge of the sniper weapon system. He must understand the capabilities and limitations of the sniper. However, sniping is an individual talent and skill that varies with each individual sniper. This compounds the planner's challenge, but these variables can be minimized with careful planning. The sniper, when properly trained and employed, can be one of the Special Operation Forces most versatile weapons systems.

SEQUENCE OF PLANNING IN A SNIPER MISSION

First the Sniper team may receive a mission briefing in either written or oral form (FRAGO). Usually, the team mission is stated specifically as to who, what, when, where and why/how. On receipt of an order the sniper analyzes his mission to ensure he understands it, then plans the use of available time. He informs the spotter/observer of the situation and mission and gives him specific and general instructions. The sniper makes a tentative plan of how he intends to accomplish the mission. When the mission is complex and time is short, he makes a quick, mental estimate; when time is available he makes a formal, mental estimate. Since an on-the-ground reconnaissance is not tactically feasible for most sniper operations the sniper uses maps, aerial and satellite photographs or digital mapping programs of the target area in his planning.

Coordination is an important piece of the planning phase, some topics to coordinate are:

- Intelligence (enemy and friendly forces, terrain, weather, light, civilians..)
- Operations (transport, link-up, resupply, crossing friendly lines, rehearsal areas, signals..)
- Fire support (target list, available fire support, control measures, no fire areas…)
- Aviation (S-3 Air, Air LNO, LZ, DZ, flight route, markings…)
- Vehicle movement

After the warning order has been issued and a thorough map reconnaissance made, most coordination should be completed. The sniper makes an intelligence update while the observer prepares himself and the equipment. The sniper completes his plan based on his map reconnaissance and or any changes in the enemy situation. He may or may not alter the tentative plan, but he can add detail. The sniper uses the OPORD format as a guide to refine his concept. He places the main focus on actions in the objective area and carefully assigns the observer specific tasks for all phases of the operation. He ensures all actions work smoothly and efficiently.

The operation order is issued in the standard OPROD format. Extensive use of terrain models, sketches, chalkboards and PC mapping should be made to highlight important details such as routes, planned rally points, and actions at known danger areas.

The sniper team rehearses the brief-back until it is near perfected before presenting it to the S-3, sniper employment officer or commander. A good brief-back indicates the team's readiness for the mission.

The sniper team ensures needed equipment is operational before signing it out. Weapons are clean, functional and test-fired to confirm zero. The team checks radios, night vision devices and any other equipment needed for the mission.
Inspections reveal the team's physical and mental state of readiness. The sniper ensures that all equipment is presented and functional and that the observer knows and understands the mission. The following items should be checked:

- Completeness and correctness of uniform and equipment
- Hats, pockets, canteens, camel-back
- Shine, rattles and tie-downs
- Weapons
- Sterilization regarding maps, personal papers

Rehearsals ensure team proficiency. During rehearsals, the sniper rechecks his plans and makes any needed changes. It is through well–directed and realistic rehearsals that the team becomes thoroughly familiar with their actions on the mission. If there is little time the team should perform a brief-back and walk-through-talk-through. Always conduct rehearsals in the same sequence as in the mission.

S-3, sniper employment officer or mission manager should make a final inspection before the team goes on the mission.

After the mission has been accomplished the staff will take the team through a debriefing. The sniper should bring data books, field sketches, photos, video, range card.

From the moment the sniper team gets their initial mission briefing or FRAGO they should be in an isolation facility. They should stay there until they are leaving for the mission. After returning from the mission the team should be directed to isolation, and then be brought to debriefing.

Types of Sniper Operations

Conventional Missions
SF Target Interdiction Missions

A conventional sniper mission and an SF target interdiction sniper mission usually differ as to degree of risk, operational techniques, mode of employment, independence from friendly support, and dependence upon operational intelligence and indigenous assets.

Levels of Missions Planning

Above Team Level
In above-team level planning, the sniper employment officer (SEO) or sniper platoon leader is responsible for the planning and coordinating the actions of more than one sniper team.

Team Level
In team level planning, the two members of the sniper team will carry out the planning, preparation, and coordination for the mission. Therefore, warning orders are not necessary at this level, and the sniper OPORD itself is a mission-planning tool.

Target Analysis - CARVER

Target analysis is the way a planner can match the sniper's capability to the potential target. The target analysis process used to analyze a target is the CARVER model: Criticality, Accessibility, Reconcilability, Vulnerability, Effect, Recoverability

Greatest Impact on Sniper Mission Planning; Accessibility and Vulnerability.

There are two general classes of sniper targets: personnel and materiel. Theses targets can be further categorized as either of tactical or strategic value. Tactical targets have local, short-term value to the current battle or situation. Tactical personnel targets for the sniper are normally of enough significance to warrant the risk of detection when firing. Such targets include:

- Enemy snipers
- Key leaders
- Scouts
- And crew served weapons

Tactical materiel targets are of particular importance to the war effort or operation.

Strategic personnel targets are not as well defined as tactical personnel targets because of problems with the concept and definition of assassination. The definition of assassination versus the elimination of a military target is a complex problem unrelated to the scope of this course. Strategic material targets consist of all types of objects of a military nature,

including components or systems within a target (such as a turbine in an aircraft or one part of an Anti-Aircraft System).

Snipers should be directed at he enemy's C2 facilities and critical nodes supporting them. Snipers can frequently regards targets as being in an interrelated system; that is, any one component may be essential to the target's entire operation. These interrelated, and essential, components are known as critical nodes. Critical C2 nodes are components, functions, or systems that support a military force's command and control.

Target analysis includes selecting the appropriate method to use against a target. In doing so, the planner can match the sniper's capabilities to the potential target. Sniper capabilities include using special weapons and performing covert execution of operations.

Attacking targets by sniper fire requires detailed planning and coordination; sniper targets should not be attacked indiscriminately. Interdiction must be conducted within the parameters of the assigned mission from higher headquarters, the desired results of the interdiction, the target's vulnerabilities, and the priorities of interdiction.

The CARVER analysis process is a generic model for special operations interdiction missions. It is also suitable for sniper interdiction, particularly during materiel interdiction planning, which is similar to interdiction with special munitions and demolitions. Sniper fire can be applied within the framework of the CARVER model to better determine if sniping would be the appropriate interdiction method, and precisely how and where to apply it. The CARVER analysis is applied to sniper interdiction based on the following criteria:

Criticality
Accessibility
Reconcilability
Vulnerability
Effect
Recoverability

Greatest Impact on Sniper Planning; Accessibility and Vulnerability.

Criticality
A target is critical in relation to the impact its destruction would have on the enemy. The mission order will largely determine critical targets. However, within a target system there may be components that may be critical for the operation of the entire target.

Accessibility
Accessibility to a target is based on how readily the target can be attacked. For the sniper, target accessibility includes getting through the target's security systems and knowing what the reaction will be to the sniper's standoff interdiction. Accessibility for sniper interdiction is unique, because the sniper can frequently engage targets without violating security systems, which, in turn, reduces the enemy's ability to detect the sniper before the interdiction.

Recuperability
The Recuperability of a target is measured in the time it takes the target to be repaired, replaced, bypassed or substituted. The concept of recuperability is essential to sniping. Frequently, planners think only in terms of total destruction as opposed to a lesser degree of destruction. The ability to control target destruction with precision fire can prevent unnecessary damage or limit adverse effects to systems on which the local populace may depend for electrical power, food, water and so forth.

Vulnerability
A target (or component) is vulnerable to the sniper if he has the weapons and skills required to interdict the critical points that the target analysis has identified. The key to target vulnerability is identifying the weakest critical link in the target system and destroying it.

Effect
The effect of interdiction includes a wide range of include a wide range of results incidents to the interdiction. Target effect is the desired result of attacking a target, including all possible implications – political, economical and social effects of the interdiction. Occasionally, the planner must decide what the desired effect is; it may be the removal of key personnel, the psychological impact of the interdiction, or the threat of interdiction.
Material target interdiction by sniper fire is much more limited than it is with personnel targets. The sniper's abilities to be enhanced by his choice of special weapons to interdict material targets, but he might still be limited by the relative vulnerability of the target. The greatest obstacle for successful interdiction of material targets rests primarily with the identification of vulnerable nodes. The goal of the sniper's fire on theses nodes is to be as effective as more powerful weapons - using precision fire at key points in stead of brute force in the general area.

Recognizability
A target is recognizable if it can be effectively acquisitioned by the sniper. A target may be well within a sniper's stand off range, but cannot be effectively engaged because the target is masked or concealed. Technical limitations, time of day, light conditions, terrain masking and environmental factors will make an impact here.

OPERATION ORDER

An Operations Order (OPORD) is a directive issued by a leader to his subordinates in order to effect the coordinated execution of a specific operation. A five-paragraph format (shown below) is used to organize the briefing, to ensure completeness, and to help subordinate leaders understand and follow the order.
Use a terrain model or sketch along with a map to explain the order. When possible, such as in the defense, give the order while observing the objective. The platoon/squad leader briefs his OPROD orally off notes that follow the five-paragraph format. A sample OPORD format follows:

OPERATION ORDER _____ (code name)
(Number)

Plans and orders normally contain a code name and are numbered consecutively within a calendar year.

References: The heading of the plan or order includes a list of maps, charts, datum, or other related documents the unit will need to understand the plan or order. The user does not need to reference the SOP, but may refer to it in the body of the plan or order. The user references a map using the map series number (and country or geographic area, if required), sheet number and name, edition, and scale, if required. Datum is the mathematical model of the earth used to calculate the coordinate on any map. Different nations use different datum for printing coordinates on their maps. The datum is usually referenced in the marginal information of each map.

Time Zone Used Throughout the Order: The time zone used throughout the order, including annexes and appendixes, is the time zone applicable to the operation. Operations across several time zones use ZULU time.

Task Organization: Describe the allocation of forces to support the commander's concept. Task organization may be shown in one of two places: preceding paragraph one, or in an annex, if the task organization is long and complicated.

1. Weather and Light Data and General Forecast:
High Moonrise Sunrise
Low Moonset Sunset
Wind Speed Moon phase BMNT
Wind Direction % Illumination EENT

2. Terrain: OCOKA

NOTE: Describe the effects on enemy and friendly forces for lines (1) and (2).

1. SITUATION

a. Enemy forces.
The enemy situation in higher headquarters' OPORD (paragraph 1.a.) is the basis for this, but the leader refines this to provide the detail required by his subordinates.
1. Include the enemy's composition, disposition and strength
2. Recent activities
3. Known/suspected locations and capabilities
4. Describe the enemy's most likely and most dangerous course of action

b. Friendly forces.
This information is in paragraph 1b, 2 and 3 of higher headquarters' OPORD.
1. Include the mission, the commander's intent, and concept of operations for headquarters one and two levels up.
2. Locations of units to the left, right, front, and rear. State those units' task and purpose and how those units will influence your unit, particularly adjacent unit patrols.

c. Attachments and detachments.
Do not repeat information already listed under
Task Organization. Try to put all information in the Task Organization. However, when not in the Task Organization, list units that are attached or detached to the headquarters that issues the order. State when attachment or detachment is to be effective if different from when the OPORD is effective (such as on order, on commitment of the reserve). Use the term "remains attached" when units will be or have been attached for some time.

2. MISSION.
State the mission derived during the planning process. There are no subparagraphs in a mission statement. Include the 5 W's: Who, What (**task**), Where, When, and Why (**purpose**).

3. EXECUTION
a. Concept of the Operations.
The concept of operations may be a single paragraph, may be divided into two or more subparagraphs or, if unusually lengthy, may be prepared as a separate annex. The concept of operations should be based on the COA statement from the decision-making process and will designate the main effort. The concept statement should be concise and understandable and describe, in general terms, how the unit will accomplish its mission from start to finish.
The concept describes—

- The employment of major maneuver elements in a scheme of maneuver.
- A plan of fire support or "scheme of fires" supporting the maneuver with fires.
- The integration of other major elements or systems within the operation. These include, for example, reconnaissance and security elements, intelligence assets, engineer assets, and air defense.
- Any be-prepared missions.

1. Maneuver.
The maneuver paragraph addresses, in detail, the mechanics of the operations. Specifically address all subordinate units and attachments by name, giving each its mission in the form of a **task** and **purpose**. The main effort must be designated and all other subordinates' missions must relate to the main effort.
Actions on the objective will comprise the majority of this paragraph and therefore could address the plan for actions on the objective, engagement/disengagement criteria, an alternate plan in the event of compromise or unplanned movement of enemy forces, and a withdrawal plan.

2. Fires.
Clarify scheme of fires to support the overall concept. This paragraph should state which maneuver unit is the main effort and has priority of fires, to include stating purpose of, priorities for, allocation of, and restrictions for fire support. A target list worksheet and overlay are referenced here, if applicable. Specific targets are discussed and pointed out on the terrain model (see chapter 3, Fire Support).

b. Tasks to maneuver units.
Clearly state the missions or tasks for each maneuver unit that reports directly to the headquarters issuing the order. List units in the same sequence as in the task organization, including reserves. Use a separate subparagraph for each maneuver unit. Only state tasks that are necessary for comprehension, clarity, and emphasis. Place tactical tasks that affect two or more units in subparagraph 3d. Platoon leaders task their subordinate squads. Those squads may be tasked to provide any of the following special teams: reconnaissance and security, assault, support, aid and litter, EPW and search, clearing, and demolitions. Detailed instructions may also be given to platoon sergeant, RTO's, compass man, and pace man.

c. Tasks to combat support units.
Use these subparagraphs only as necessary. List CS units in subparagraphs in the same order as they appear in the task organization. Use CS subparagraphs to list only those specific tasks that CS units must accomplish and that are not specified or implied elsewhere. Include organization for combat, if not clear from task organization.

d. Coordinating instructions.
List only instructions applicable to two or more units and not routinely covered in unit SOPs.
This is always the last subparagraph in paragraph 3. Complex instructions should be referred to in an annex. Subparagraph d(1) -d(5) below are mandatory.
(1) Time Schedule (rehearsals, back briefs, inspections and movement).
(2) Commander's critical information requirements (CCIR)
(a) Priority intelligence requirements (PIR) – Intelligence required by the commander needed for planning and decision-making.
(b) Essential elements of friendly information (EEFI). – Critical aspects of friendly operations that, if known by the enemy, would compromise, lead to failure, or limit success of the operation.
(c) Friendly force information requirements (FFIR). – Information the commander needs about friendly forces available for the operation. May include personnel status, ammunition status, and leadership capabilities.

(3) Risk reduction control measures. These are measures unique to this operation and not included in unit SOPs and can include mission-oriented protective posture, operational exposure guidance, vehicle recognition signals, and fratricide prevention measures.
(4) Rules of engagement (ROE).
(5) Environmental considerations.
(6) Force Protection
(7) Movement Plan. Use terrain model and/or sketch. State azimuths, directions, and grid coordinates.
a. Order of Movement, formation, and movement technique
b. Actions at halts (long and short).
c. Routes.
d. Departure and Re-entry of friendly lines.
e. Rally points and actions at rally points (plan must include IRP, ORP, PF, and RRP and all other planned rally points to include grid location and terrain reference).
f. Actions at danger areas (general plan for unknown linear, small open areas and large open areas; specific plan for all known danger areas that unit will encounter along the route.

4. SERVICE SUPPORT
Address service support in the areas shown below as needed to clarify the service support concept. Subparagraphs can include:
a. General: Reference the SOP's that govern the sustainment operations of the unit. Provide current and proposed company trains locations, casualty, and damaged equipment collection points and routes.
b. Materiel and Services.
(1) Supply
a. Class I – Rations Plan
b. Class V – Ammunition
c. Class VII – Major end items (weapons)
d. Class VIII – Medical
e. Class IX – Repair parts
f. Distribution Methods
(2) Transportation
(3) Services (Laundry and showers)
(4) Maintenance (weapons and equipment)
a. Medical evacuation and hospitalization. Method of evacuating dead and wounded, friendly and enemy personnel. Include priorities and location of CCP.
b. Personnel support. Method of handling EPW's and designation of the EPW collection point.

5. COMMAND AND SIGNAL
This paragraph states where command and control facilities and key leaders are located during the operation.
a. Command.
(1) Location of the higher unit commander and CP.
(2) Location of key personnel and CP during each phase of the operation.
(3) Succession of Command.
(4) Adjustments to the patrol SOP.

b. Signal.
(1) SOI index in effect.
(2) Methods of communication in priority.
(3) Pyrotechnics and signals, to include arm and hand signals.
(4) Code words.
(5) Challenge and password (used when behind friendly lines).
(6) Number Combination (used when forward of friendly lines).
(7) Running Password.
(8) Recognition signals (near/far and day/night).

c. Special Instructions to RTOs.

6. ISSUE ANNEXES.

7. GIVE TIME HACK.

8. ASK FOR QUESTIONS.

Part 2

Employment of Snipers

Employment and deployment of Special Operations Snipers

Organization of snipers

Sniper team organization determines their effect on the enemy and success as a support activity. Snipers require special organization, because sniping is an individual specialty requiring independence of action to achieve the greatest potential effect.

Sniper Pair / Team

Base element,
Provide mutual security,
Engage targets more rapidly,
Lengthen their duration of employment,
Diminish fear and stress.

Sniper Squad

Located at coy level / unit level and will depend on type of unit. A squad will consist of 3-4 Sniper Pairs, and you might find the following members:

- Squad leader
- Assistant squad leader
- Senior sniper
- Junior sniper

Missions for Snipers

Mission of Sniper Squad /Platoon

The Snipers Platoon will support operations as a part of the unit / company. Company is the lowest level where sniping can be centralized. Snipers should not be attached to tactical subunits.

SF Sniper Teams Capabilities and Limitations

The sniper teams engage targets at a distance from 50 to 1500 meters. In many DA missions the range to the target will often be as short as 50 meters, especially in cities and around buildings. They will move in close proximity to the enemy to gather intelligence for himself (targeting) or his higher element J/S-2 (HUMINT). The snipers might be tasked to destroy or damage selected pieces of material or hard targets (0.50 cal, long ranges) or engage human targets up to 900 meters on a selective basis.

Capabilities for Snipers Teams

Cause confusion and hesitation among the enemy leaders.
Cause early deployment of attacking forces.

Deny use of terrain for short period of time.
Selectively suppress enemy in defence or attack.
Generally demoralize the enemy by denying leaders a safe heaven in the rear to plan or consolidate their forces.

Sniper Teams Limitations

Not capable of:

- seizing and holding ground,
- laying down a base of fire,
- becoming decisively engaged.

Snipers are not wily Ninja's sneaking around killing everything that they can.
Snipers are not invincible and should not be deployed in these situations.

Sniper Deployment Considerations

Basic deployment is a 2 man team.
Both members of the team are Sniper qualified.
Augmented with squad or platoon.
Multiple teams can be deployed together on the same mission.

Sniper Employment in General

Four factors to consider:

1. Planning
2. Coordination
3. Control
4. Type of support given and received

Planning

Direct Action (Primary).
HUMIT (Secondary).
Pre-infiltrate on offensive operations.
Plans smallest details.
Planning accomplished with Sniper coordinator, Sniper Team(s), and Supported Unit.

Coordination

Coordinate with supported and unsupported units, de-confliction is very important on the battlefield where many forward elements are working.

Control

Accomplished through detailed plans of action, and Rules of Engagement (ROE). These are measures that protect Snipers from enemy and friendly forces. The

commander needs ability to recall team if needed. The unit must have Non-technical and technical control measures.

Support

During preparation consider:

- that snipers should be given maximum latitude/freedom during planning.
- economy of force.
- not number of kills but quality kills.
- intelligence on the enemy.
- allowed freedom in supported units area:
    1. General Guidance on Movement
    2. Location
    3. Targets

Types of Sniper Operations

Conventional Missions
SF Target Interdiction Missions

A conventional sniper mission and an SF target interdiction sniper mission usually differ as to degree of risk, operational techniques, mode of employment, independence from friendly support, and dependence upon operational intelligence and indigenous assets.

Types of Missions

Conventional Missions:

Deliver precise long-range fire on selected targets.
Collect and report battlefield information.

SF Target Interdiction Missions:

Engage long-range targets with precision fire.
Obtain and report enemy intelligence information.
The SF sniper is a selected volunteer specially trained in advanced marksmanship and field craft skills who can engage selected targets from concealed positions at ranges and under conditions that are not possible for the normal rifleman.

Conventional Sniper Missions

Characteristics of a Conventional Sniper Mission

Area Targeting
Combined Arms
Close Operations

Area Targeting
Conventional sniper operations also include combat patrols, ambushes, counter sniper operations, forward observation elements, military operations in urbanized terrain, and retrograde operations in which snipers are part of the forces left in contact or as stay-behind forces

Combined Arms
Conventional snipers are part of a combined arms force. They are a versatile support arm available to an infantry commander.

Close Operations
Conventional snipers conduct close operations. Assigned or attached to conventional frontline units, the sniper's role is unique in that it is the sole means by which a unit can engage point targets at distances beyond the effective range of the standard infantry rifle.

SF Target Interdiction Missions

Characteristics of SF Target Interdiction Missions

Specific Targeting
Snipers engage specific targets at a designated place and time and interdict both personnel and materiel point targets in support of SO missions in all levels of conflict. Such missions tend to be complex and may require the sniper to conduct:

- A difficult infiltration,
- Employ precise navigation to the target,
- Evade enemy forces,
- Breach sophisticated security systems,
- And use external mission support systems such as safe houses, special intelligence, etc.

Mode of employment
Snipers operate independently from the main force and are employed in unconventional warfare (UW), foreign internal defense (FID), direct action (DA), special reconnaissance (SR), and counter terrorism (CT). They may also be used in peacetime to assist foreign governments and train foreign military snipers.

Conduct of operations
SF Snipers conduct counter terrorism operations, safeguard national citizens and property abroad, conduct recovery operations, conduct deception operations, conduct show of force operations, conduct rescue operations, and conduct operations that support the National Command Authority's (NCA) strategic goals.

Depth of Operations
SF snipers conduct long-range or deep operations as a part of a larger SOF. They operate in hostile, denied, or politically sensitive areas during peacetime, conflict, and war and independently or in coordination with operations of conventional forces.

Independent-Support Spectrum of SF Missions
SF snipers operate independently from the main force and are employed in:
- Direct action (DA),
- Special reconnaissance (SR),
- Counter terrorism (CT),
- Unconventional warfare (UW),
- Foreign internal defense (FID),
- Other specific missions.

Specific Sniper Employment

War Time Employment
Snipers should be used to harass, impede, destroy and prevent movement of enemy units.

Peacetime Employment
Snipers Teams might be used to:
- Assist foreign governments
- Train foreign military snipers
- Conduct counter terrorism operations
- Safeguard national citizens and property abroad
- Conduct recovery operations
- Conduct deception operations
- Conduct show of force operations
- Rescue operations
- Operation that support the national/international strategic goals

Types of Operations
Offensive Operation
Defensive Operations
Retrograde Operations
Special Operations

Offensive Operations
Pre-offensive:
1. HUMINT/ reconnaissance
2. Harassment
3. Infiltration

Attack

Post-offensive

1. Consolidation on objective
2. Interdiction
3. Security
4. Counter sniping

Other Offensive Operations

Movement to Contact
Attack of built-up or fortified areas
River crossings
Support of reconnaissance and combat patrols
Extended ambushes
Cordon operations

Defensive Operations

Area defense
Perimeter defense
Security forces
Reverse slope defense
Defense of built-up or fortified area
River line defense
Mobile defenses
Economy of forces

Retrograde Operations

Delaying forces
Obstacles
Counterattacks
Stay-behind operations

Special Operations

UW Operations
FID and IDAD Operations
DA Operations
Counter-terrorism and -guerrilla Operations
SR Operations
Counter Sniper Operations

UW Operations

Organize and train resistance snipers.
Sniper importance in UW not measured in kills.

Mission normally include:

1. Harassment
2. Infiltration
3. Interdiction
4. Sniper ambush
5. Security and surveillance
6. Offensive/Defensive operations
7. Defensive operations

Foreign Internal Defense (FID)

Participation of civilian and military agencies of government in any of the action programs taken by another government to free and protect its society from subversion, lawlessness, and insurgency.

Internal Defense and Development (IDAD)

Action taken by a government to free and protect its society from subversion, lawlessness, and insurgency without outside support.

SO Missions In FID/IDAD

Urban guerrilla warfare
Sniper cordon /periphery OPS
Sniper ambushes
Urban sniper hides
Civil disorder

Direct Action (DA)

Engaging enemy security forces/key personnel
Reinforcing units
Locating enemy personnel and position
On target security

Counter Terrorism Operations

In CT operations, snipers provide 3 primary functions:

Deliver discriminate fire to interdict hostile targets
Cover entry teams with rifle fire
Provide CT Force Commander with accurate intelligence

In CT Ops the snipers will often be the Commanders only view of the target. They will be positioned early in ideal observation points, if possible to provide Commander with live video coverage of the target.

Counter Guerrilla Operations

Rear area protection.
Protect sensitive facilities or installations.
Cover gaps between units, covering obstacles, and tracking enemy patrols that have penetrated the rear area.
Counter-sniping.

SR Missions

Report timely and accurate intelligence including:

- Large troop movements
- Signature weapons
- Troop concentrations and reserve locations
- Ops and weapons locations
- C3 facilities

Establish hide location and start OP log
Report PIR/IR as required
May transfer to support DA

Part 3

Individual camouflage and concealment / Ghillie Suit

Individual camouflage and Equipment

Individual Camouflage
•The **primary mission** of the sniper team is to eliminate enemy targets with long-range precision fire.
•How well the sniper accomplishes his mission depends on the knowledge, understanding, and application of various field techniques that allow him to move, hide, observe, and detect targets
•Success on the battlefield for a sniper is determined not only by his shooting ability but also his ability to survive.
•This can be accomplished only by his not revealing his position to the enemy.
•A sniper should have a basic **knowledge of camouflage and concealment** principles and techniques.
Camouflage is one of the basic weapons of war. It can mean the difference between a successful or an unsuccessful mission. To the sniper team it can mean the difference between life and death. Camouflage measures are important, since the team cannot afford to be detected at any time while moving alone, as part of another element, or while operating from a firing position. Marksmanship training teaches the sniper to hit the target, and knowledge of camouflage teaches him how to escape becoming a target. A sniper must be camouflage conscious from the time he departs on a mission until the time he returns. Paying attention to camouflage fundamentals is a mark of a well-trained sniper.

Concealment is protection from the view, either direct or indirect, of hostile forces and may be by natural or artificial means.

Concealment is not necessarily the same as cover. Cover provides concealment, but concealment does not always provide cover. Concealment does not necessarily give the sniper protection from enemy fire if he is detected, and cover does not necessarily give him protection from enemy observation.
Camouflage is the disguising of military equipment or installations, or oneself, with paint, nets, or foliage. It consists of the measures taken by a sniper to conceal himself from enemy observation, whether direct or indirect, and may be by natural or artificial means.
Target Indicator

A target indicator is anything a sniper does or fails to do that will reveal his position to an enemy. A sniper must know these target indicators if he is to locate the enemy as well as prevent the enemy from locating him.
Olfactory. Olfactory indicators are those indicators that the sniper can smell. Cooking food, fires, cigarettes, aftershave lotion, soap, and insect repellents are examples. Most olfactory target indicators are caused by the sniper's bodily functions.

Tactile. Tactile indicators are those indicators that the sniper can touch. Trip wires, phone wires, and hide positions are examples. The tactile indicator is used mainly at night.

Auditory. An auditory indicator is a sound that can be made by movement, equipment rattling, coughing, talking, whistling, or singing. These types of target

indicators are most noticeable during the hours of darkness. The enemy may dismiss small noises as natural, but when they hear someone speak, they know for certain that others are near.

Visual. The visual target indicator is the most important target indicator. The primary reason the sniper is detected is because he has been seen by the enemy. Subcategories of visual target indicators will aid the sniper in locating the enemy and will help prevent

The principles of concealment include the variables of shape, shadows, silhouettes, surface, spacing, color, movement, and sitting. (Well there are different options of how you name these groups, however in principle they are the same)

A sniper must be camouflage conscious at all times, from the time he departs on a mission until the time he returns. Paying attention to camouflage fundamentals is a mark

The proper use of camouflage clothing and equipment, both artificial and natural, requires careful attention to the following fundamentals:

Take advantage of all natural concealment, such as trees, bushes, grass, earth, man-made structures, and shadows.

Alter the form, shadow, texture, and color of objects.

Camouflage against ground and air observation.

Camouflage a sniper post, as it is prepared.

Study the terrain and vegetation in the area. Arrange grass, leaves, brush, and other natural camouflage to conform to the area.

Use only as much material as is needed. Excessive use of material, natural or artificial, can reveal a sniper's position.

Obtain natural material over a wide area. Do not strip an area, as this may attract the enemy's attention.

Camouflage construction is based on the three fundamentals of concealment.

Hiding. Hiding is a means a sniper uses to conceal himself and his equipment to evade detection.

Blending. Blending is when a sniper uses the art of camouflage in such as way as to become a part of, or blend in with, the surrounding area or background.

Disguising. Disguising is when the sniper deceives the enemy into false conclusions regarding his position, intentions, or movement.

Terrain patterns and weather conditions affect the camouflage needed for a mission.

Weather conditions for the duration of the mission must be considered, since the weather changes.

Terrain patterns vary during the mission. The terrain pattern at the objective may be quite different from the pattern of the routes to and from the objective

The two types of camouflage that a sniper team can use to camouflage themselves and their equipment are natural and artificial.

Natural. Natural camouflage is vegetation or materials that are native to the area of operations. The sniper team should always augment their appearance by using some natural camouflage

Artificial. Artificial camouflage is any material or substance that is produced for the purpose of coloring or covering something in order to conceal it.

Camouflaging the Skin
Facial patterns can vary from irregular stripes across the face to bold splotching. The best pattern, perhaps, is a combination of both stripes and blotches. The sniper should avoid wild types of designs and colors that stand out from the background.

When using the camouflage paint sticks, the sniper should cover all exposed skin, to include

- The hands and forearms.
- The neck, front and back.
- The ears, and behind the ears.
- The face.
- The forehead is darkened.
- The cheekbones are darkened.
- The nose is darkened.
- The chin is darkened.
- Under the eyes are lightened.
- Under the nose is lightened.
- Under the chin is lightened.

The sniper must also camouflage all the equipment that he will use on his mission. However, he must ensure that the camouflage does not interfere with or hinder the operation of the equipment.

Camouflaging Equipment
The sniper must camouflage the SWS to break up its outline. However, he must not bind the scope to a point that it will not adjust properly or have loose garnish that will get caught in the bolt of the weapon. The sniper cn carry the SWS in a drag bag with garnish similar to the ghillie suit; however, the SWS will not be combat ready while it is inside the drag bag. Netting, garnish, and paint can be used to camouflage weapons.

The SWS can be painted with a removable paint (Bow Flage) so that the colors can be changed to suit different vegetation and changing seasons. This paint will not affect the accuracy or performance of the weapon. However, care must be taken when applying this paint.

The sniper must not allow the Bow Flage paint to contact the lens of optical equipment, the bore of the SWS, the chamber, the face of the bolt, the trigger area, or the adjustment knobs of the telescope.

Bow Flage is easily removed with Bow Flage remover or Shooter's Choice cleaning solvent, but it will not damage the SWS to store it with the paint on it.

The optics used by the sniper team must also be camouflaged to break up the outline and reduce the possibility of light reflecting of the lenses. The lenses can be covered with mesh-type webbing or nylon hose material. A mask, slotted or holed, a hood, and veil can be used to camouflage lenses.

Load bearing equipment or rucksacks can be camouflaged with paints, dyes, netting, or garnish covers. However, if the sniper is using the rucksack while wearing the ghillie suit, he must camouflage the pack the same as the suit.

Sniper Suit or Ghillie Suit

The term "ghillie suit" originated in Scotland during the 1800s. Scottish game wardens made special camouflage suits in order to catch poachers. Today the ghillie suit is a specially constructed uniform or outer smock that is covered with irregular patterns of cloth strips, garnish, or netting

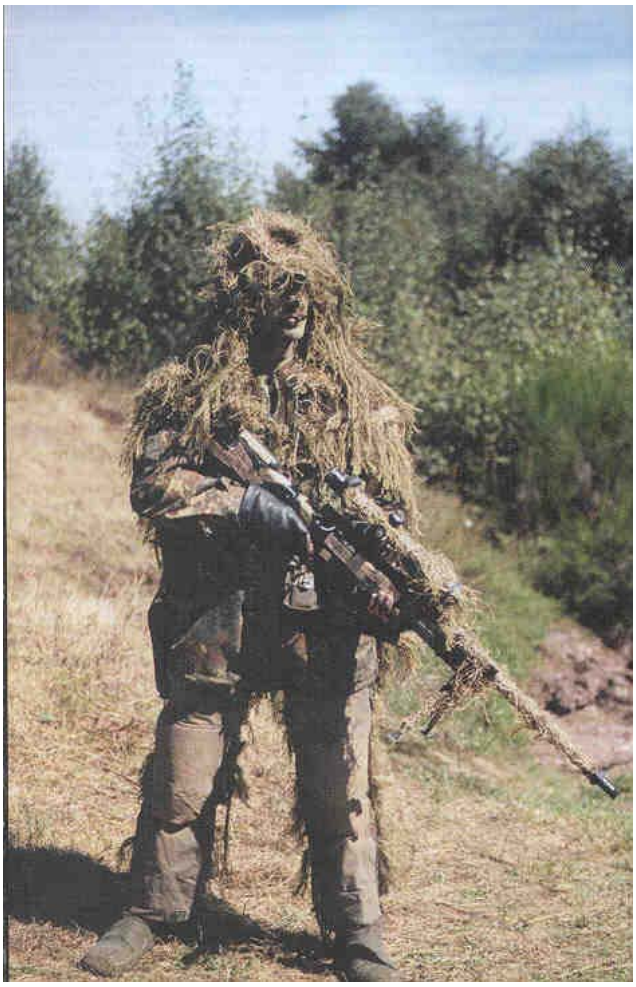
Ghillie suits can be made from BDUs or one-piece aviator-type uniforms/coveralls. Turning the uniform inside out places the pockets inside the suit. This protects items in the pocket from damage caused by crawling on the ground.

The front of the ghillie suit should be covered with canvas or some type of heavy cloth to reinforce it. The knees and elbows should be covered with two layers of canvas, and the seam of the crotch should be reinforced with heavy nylon thread, since these areas are prone to wear out more often. The use of Shoe Goo glue is an excellent adhesive for attaching the canvas to the uniform

The ghillie suit is covered with irregular patterns of garnish of blending colors. Strips of garnish or netting are folded in half and sewn mainly on the back, the legs, the arms, and the shoulders. Then the strips are frayed or cut longways to give the suit the appearance of vegetation. The garnish or netting should cover the shoulders and reach down to the elbows on the sleeves. The garnish applied to the back of the suit should be long enough to cover the sides of the sniper when he is in the prone position. A bush hat is also covered with garnish or netting. The garnish should be long enough to break up the outline of the sniper's neck but not so long in front that it obscures his vision or hinders movement. A cut-up hammock makes an excellent foundation for the garnish.

The suit can also incorporate close-mesh netting sewn to the back of the neck and shoulders and draped over the head to form a veil. The veil is used while in position to break up the outline of the head, hide the riflescope, allow movement of the hands without fear of detection, and conceal the ejection of brass.

The veil, when draped over the head, should come down to the stomach or belt and have camouflaged garnish tied to it to break up the outline of the head and the solid features of the net. When the sniper is walking, he pushes the veil back on his head and neck so that he will have nothing obstructing his vision or hindering his movements. The veil is, however, worn down while crawling into position or near the enemy.



Most of the tips said above will apply as well for you equipment. However make sure the camouflage you use will not disturb the function of your weapon and optic and not hider you to operate with it.

If you overdo the ghilli it will be again useless because you look again obvious.

Follow the simple rule “as lees possible as much needed”.

In order to achieve operability even further changes are recommended on your base uniform:

- 3 pockets on the reverse page of the Field Jacked or Smocks (at least leg pocket size)
- 1 pocket on the forearms DIN A5
- 1 approx. pocket on the upper arms approx. DIN A5 left breast pocket change so that a radio can be operated.

Many Snipers are enlightened on account of the black boots. The effort of the Desert Boots (US) or civilian boot with bright sole is reasonable!

Gloves for Snipers should consist of leather. For this purpose, the tops are cut off in order to be able to carry out the firing skills and handling on the IF and other device.

Camo tape (cloth) characterizes itself for camouflaging device (e.g. Spotter scope and tripod).

The camouflaging cape is available as a blank and must still be loaded with cords and remnants (fluffs). Beltline is given at training.

Black small cable ties are suitable for the efficient camouflaging of outfit and would should of on stock every Sniper its (approx. 50).
The following references serve as further information.

Making a Ghillie:

Ghillie jacket:

- Material:
- Jacket or Parka without hood
- Hessian fabrics, green, brown, black colored
- Elastic bands, green
- Glue gun / shoe goo
- Wire brush
- Elbow protection
- Sewing kit

Time effort: approx. 10 – 15 hr

Manual:

The different Hessian fabrics are in pieces of 30 –50 cm of length and 3 cm of width to right tailored.
For care of the elbows, an elbow protection is to be sewn onto the jacket.
If a net is used for fixing, it is sewn on the back and the arms.
The Hessian pieces are now linked into the net with a half stroke so that the parts overlap.
The second possibility a camouflage to position, is the use of a glue gun, a faster operation allows them as bookbinding the Hessian into the net. The advantage is of course here in saving of time and the Hessian can be positioned more irregularly. For this purpose, a drop of glue is put on onto the jacket and a Hessian fabric stripe put for

aid together immediately pressurized. Gloves should be employed in a borne manner for this or a wood block.
If it is worked with the being adhesive pistol, elastic bands with a length are first sewn by 10 cm onto the jacket.
The jacket is camouflaged so far that the breast and stomach field remains to a large extent free, for this purpose, the last Hessian are positioned in the front shoulder field.
If the glue is cold, brushes the Hessian down , the Hessian is now frayed with the wire brush. The brushed material can be bonded for finer camouflage on again.

Ghillie trousers:
Material:

- Trousers
- Hessian
- Knee protection
- Glue gun
- Wire brush
- Sewing kit

Time effort: 6 hr approx. manual:

At the correct building of the Ghillie jacket, the Hessian reach up to the thighs. The operation steps resemble that, the Ghillie jacket.
The Hessian fabrics should still reach the shoes, around a liquid crossing to achieve The knee cushions are sowed either outside or inside into the trousers. In addition, it is possible to sew on insertions those include an exchangeable upholstery through Velcro. In such a way, the legs should be cut that a practicing rising with shoes remains possible. One should pay attention too here to the Use of the pockets.

2. Headgear:
Material:

- Jungle hat or field cap.
- Hessian

Time effort: approx. 2 hrs.

Manual:
A neck protection, which is about 40 cm long, is attached to the rear of the hat with Hessian fabric. The head form should merge with it. The Hessian is now positioned on the side and neck in known manner. The brushed material of the wire brush should be employed on the top face. At the front is a net as face- protection positioned that should for instance reach except for the nose top down. If required, this is placed via optics.

3.Boots:
Material:

- Natural-colored Trekking boots –
- Hessian fabric -

Time effort: approx. 1 hr.

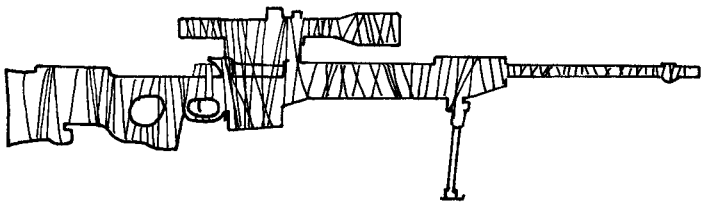
Manual:
Hessian fabric bleeding and residue of the wire brush is glued on.
The outlines of the joints and similar things are obscured besides with different camouflaging color.
If black combat boots are employed, it must become so far camouflaged that the black disappears.
This can come about with Hessian or with Hessian fabric as „Over boot". That may employ achieved by gaiters a similar success.

4. Gloves:
Material:
- Pilot Cloves / work gloves
- Glue gun
- Hessian

Time effort: approx. 1 hr.

Manual:
The firing finger is cut off or notched by the gloves to height of the second link. The size should be like this that bearing additional gloves is also possible to insulation for cold. Some short Hessian are now bonded with the glue gun on and in the finger field the brushed material from the wire brush. The back of the hand is only processed here.

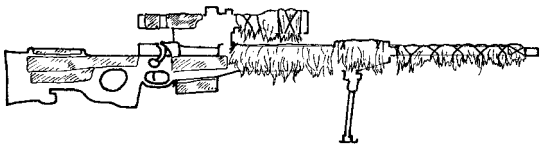
5. Weapon:
Material:
Spray beige
Spray brown
Spray green
Tape
Cord



Instructions:
All sensible places first become taped and/or cleaned up.
Arm numbers, protection colors, deduction mechanics, Delta, optical faces, scales on the telescopic sight, case expectoration and inner lock parts must be protected.
The gray basic camouflage then becomes put on. All magazines, the flash eliminator, solar shading and the honeycomb filter are also camouflaged.
After drying, a „Horizontal line pattern" becomes prepared (rough draft) by means of the cords.
The Weapon is then camouflaged with brown and green further.

Alternateive

Material:
- Tape if possible green cloth tape
- Hessian
- Rubber band



Time effort: approx. 1 hr.

Manual:
The tube of the weapon and all other big faces may become with Tape pasted where the shoulder rest can remain free. With Hessian the barrel is now wrapped so that the Hessian hang up to the ground down. The bipod is also wrapped with Hessian and aerated with residue of the wire brush Hessian. One camber parts only with the residue from the wire brush. Rubber bands, which include natural camouflage, still besides are attached in different places.
It is to be ensured that the full effectiveness of the weapon is maintained. Further, the barrel must be free floating. As fixing camouflage a camouflaging cloth envelope can also be placed around the weapon and it can be attached with Velcro.

Part 4

Advance rifle

Marksmanship

ADVANCED **R**IFLE **M**ARKSMANSHIP

FOUR FUNDAMENTALS OF SHOOTING

- **Positions**
- **Aiming**
- **Breath Control**
- **Trigger Control**

POSITIONS

All shooting position must be:

- Solid
- Stable
- Durable

The common basics of all shooting positions are as follows:

- Obtain the Natural Point of Aim
- Muscle relaxation during the act of shooting is very important
- Support your weapon with bone support, not muscle support
- Maintain the same spot weld from shot to shot
- Never cant your weapon while firing or aiming
- Hold the weapon as steady on target as possible
- Squeeze the trigger with the part of your finger just in front of the first joint
- Always place the stock in the hollow of your shoulder
- Follow through after each shot

AIMING

Aiming consist of:

•Relationship of the eye and the sights

- •Place the eye about 2/3 inches from rear sight (5/7 cm) to maintain proper eye relief
- •Concentrate on the front sight
- •Attempt to keep both eyes open. It allows you to see naturally and helps relax
- •Do not attempt to aim for more than 5 to 6 seconds without blinking

•Sight Alignment (is the relationship of the front sight to the rear sight and consists of ensuring that the front sight is placed in the rear sight aperture at the same point shot after shot)

- •Measured in Minutes of Angle (MOA)
- •Four Basic Methods:
  - –Front Sight Post Centered
  - –Front Sight Block (M21, M4, and M16)
  - –Front Sight Hex Screw (M21)
  - –Front Sight Hood (M24)

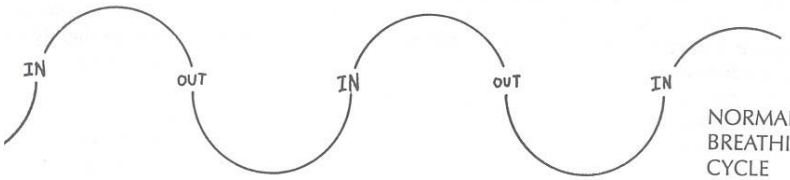
•Sight Picture (is the relationship between the target and the aligned sights)

•Calling Your Shot (it consists of telling your observer where the sights were when the shot was fired)

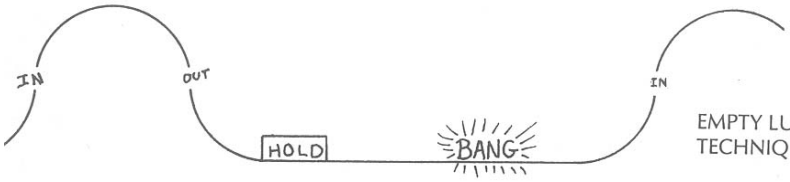
- •Use the clock system from the center of the target for direction of impact (6 o'clock, 9 ring)
- •The shooter does not guess where the shot went
- •The shooter does not ask the observer where the bullet impacted on the target, he tells the observer
- •Calling your shot aids the observer and the shooter in zeroing the weapon.

BREATH CONTROL

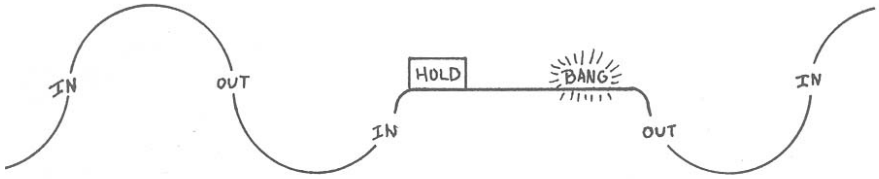
•You will note that when you breathe, there is a point during exhalation where the breath stops momentarily without effort. This is called the natural respiratory pause. To remain relaxed during firing, you should hold your breath at this point and fire the weapon
•You will be able to hold the natural respiratory pause for 5 or 6 seconds without discomfort. You will note that this is the same amount of time you can hold your eyes on aim without problems
•If you breath while you are sighting, you will notice that the sight rises and falls with your breaths
•The natural tendency of your weapon to rise and fall during breathing means that you can fine tune your aim by holding your breath at the point in which the sights rest on your aim point
•Do not hold your breath longer than 5 or 6 seconds during trigger control, as discomfort (blurred vision, muscle twitches, increased heart rate, and loss of concentration) will occur from oxygen depletion



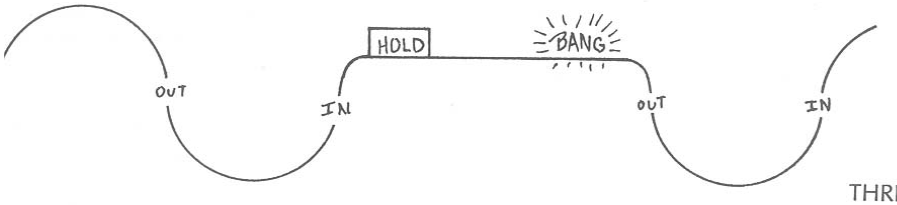
NORMAL BREATHING CYCLE



EMPTY LUNG TECHNIQUE



HALF-FULL LUNGS



THREE-QUARTERS FULL

•Not only must you squeeze the trigger without disturbing the lay of the weapon, you must move the trigger finger independently of the grip of the shooting hand and the rest of the body's muscles
•Since the eye should not be on aim for more than 5 or 6 seconds, it is imperative that you make the shot during that time frame, or the entire process must begin again.
•There are two basic methods of Trigger Control and a variation of these methods for semiautomatic weapons such as the M21
–Constant Pressure or "Surprise Shot"
–Interrupted Pressure
–Trophy Trigger

•Constant Pressure or "Surprise Shot"
Use this method when there is a stationary target and the position is steady. This type of trigger control will help you avoid flinching, jerking, and bucking the weapon

•Interrupted Pressure
Use this method for unsteady positions, such as off-hand. Stop the squeeze as the sights drift off target, and reapply the pressure as the sights drift back on the target. Again, DO NOT jerk the trigger when the sights are aligned and the "perfect" sight picture occurs.

•Trophy Trigger
–Semi Automatic Rifles With 2 Stage Trigger
–Used in Rapid Fires
–Eliminates the Slack

•Remember, there is no such thing as a perfect sight picture. It is impossible to hold the rifle perfectly steady on the target, so there will be some movement of the rifle. You must get the shot off while the rifle is moving the least

•To squeeze the trigger, use the area just before the first joint. When you place the finger on the trigger, do not allow the finger to come in contact with the stock of the weapon. Try to place the finger near the bottom of the trigger. This will help prevent the finger from resting on the stock. Also, when the finger is placed near the top of the trigger, the trigger pull will increase, which could cause erratic shots due to the disturbance of the weapon during the trigger pull

•Remember that trigger control is a matter not only of muscle control, but mind control as well. Control your muscles to allow your finger to work independently from the rest of your body. Control your mind so that you do not jerk the trigger and fire the weapon when your mind wants to shout SHOOT

•There are four Basic Trigger Control Errors

–Jerking

–Flinching

–Bucking

–Anticipating the Shot

SHOOTING ERRORS

•Horizontal Group
–Incorrect Horizontal Sight Alignment
–Canting the weapon
–A Loose Front Sight
–Muscling the Weapon onto the Target
–A loose position

•Vertical Group
–Breathing While Shooting
–An Improper Vertical sight Alignment
–Changing Spot Well from shot to shot

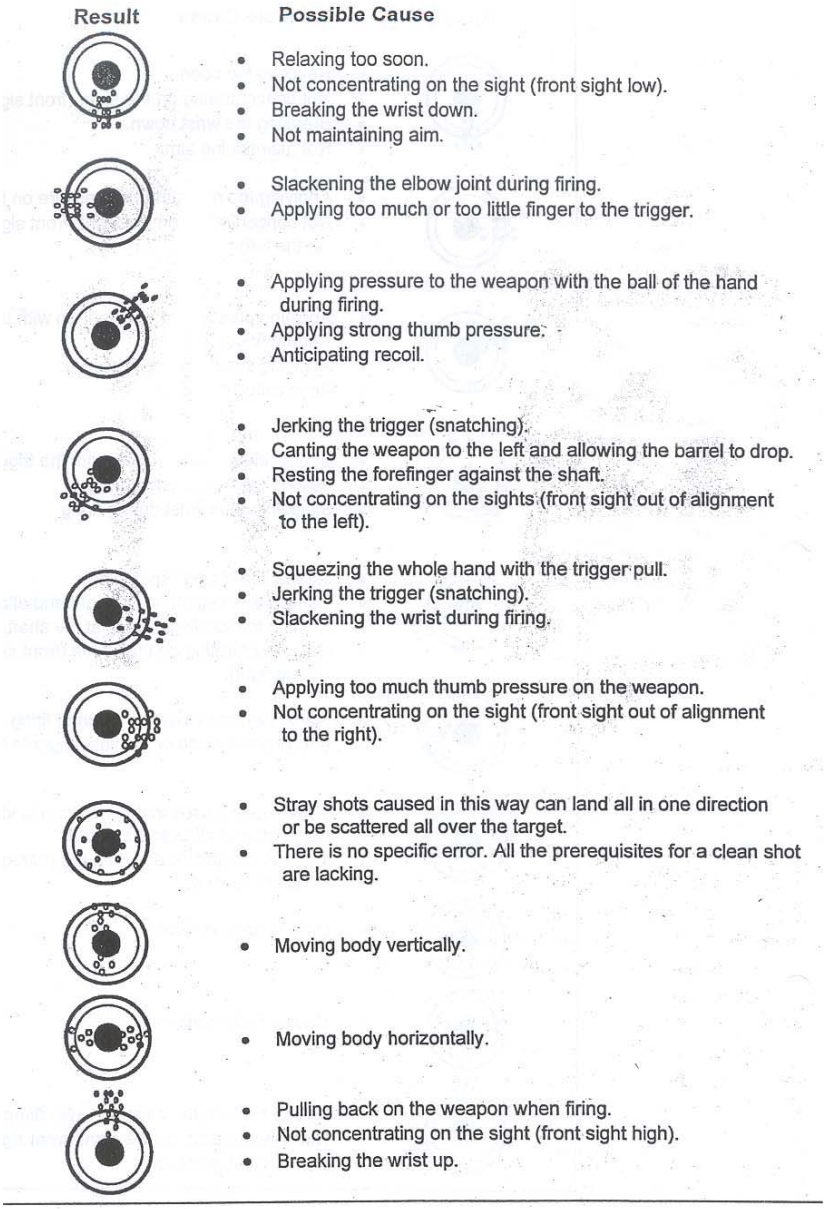
•Group From Center to the Bottom
–A Loose Rear Sight
–Sling Sliding Down the Arm
–The Shooter Being Too Low in the position
–Change in Shoulder to Stock Position from shot to shot

•Group Strung Low and to the Right or Left
–Improper Trigger Control (Jerking the trigger)
–(Prone position) The non-shooting elbow not being under the weapon, a loose sling, or the shooting elbow changing positions during shooting
–(Sitting position) The shooting elbow slipping out or the nonshooting elbow slipping down the leg

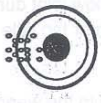
•Tight Group Out of Bull's-Eye
–Incorrect Zero
–Bad Wind Call
–Incorrect Position
–Not Having A Natural Point of Aim

•Tight Group with Erratic Flyers
–Flinching
–Bucking
–Jerking
–Anticipating the Shot

•Scattered Group:
–Incorrect sight alignment and/or sight picture
–Focusing the eye on the target instead of the front sight
–Changing Spot Weld after every shot
–A Loose Position
–A Lack of Concentration



Shooting chart for the right-handed shooter.

Result	Possible Cause
	• Relaxing too soon. • Not concentrating on the sight (front sight low). • Breaking the wrist down. • Not maintaining aim.
	• Applying too much thumb pressure on the weapon. • Not concentrating on the sight (front sight out of alignment to the left).
	• Applying pressure to the weapon with the ball of the hand during firing. • Applying strong thumb pressure. • Anticipating recoil.
	• Squeezing the whole hand with the trigger pull. • Jerking the trigger (snatching). • Slackening the wrist during firing.
	• Jerking the trigger (snatching). • Canting the weapon to the right and allowing the barrel to drop. • Resting the forefinger against the shaft. • Not concentrating on the sights (front sight out of alignment to the right).
	• Slackening the elbow joint during firing. • Applying too much or too little finger to the trigger.
	• Stray shots caused in this way can land all in one direction or be scattered all over the target. • There is no specific error. All the prerequisites for a clean shot are lacking.
	• Moving body vertically.
	• Moving body horizontally.
	• Pulling back on the weapon when firing. • Not concentrating on the sight (front sight high). • Breaking the wrist up.

Shooting chart for the left-handed shooter.

POSITIONS

- Standing Unsupported or Off-hand
- Sitting Unsupported
- Kneeling Unsupported
- Prone Unsupported

PROS AND CONS OF VARIOUS SHOOTING POSITIONS

	-FIELD OF FIRE	-STABILITY	-PROTECTION	-SPEED TO ASSUME
STANDING	Best, Wide	Poor	Hazardous	Fastest
KNEELING	Fairly Good	Mediocre	Still Dangerous	Very Fast
SITTING	Restricted	Better	Better	Fair
PRONE	Worst, Narrow	Best	Best	Slowest

THE INTEGRATED ACT OF SHOOTING

	READY	AIM	FIRE	FOLLOW-THROUGH
BODY POSITION	Nat. Pt. of Aim Comfortable Muscle Tension Butt in Shoulder	Final fine adjustments, taking slack out of sling, grip beanbag, bipod steady	Steady, Stable, Firm	Absorb Recoil Continue Steady hold, eject cartridge, reload
SCOPE PICTURE	Scope Picture is clear, fills the eyepiece, target visible	Slight reticle movement due to beathing, focus back and forth at target and reticle	Crosshair exactly on target, in focus at instant of firing	Continue focus on target, observe results, call shot
TRIGGER CONTROL	Safety is off, Finger lightly on trigger	Take slack out, pull directly back, just to edge of release	Straight, clean pull, breaks clean, too	Leave finger lightly on trigger
BREATHING	Normal Cycle	Deeper Inhale/Exhale	Inhale half, HOLD	Back to Normal

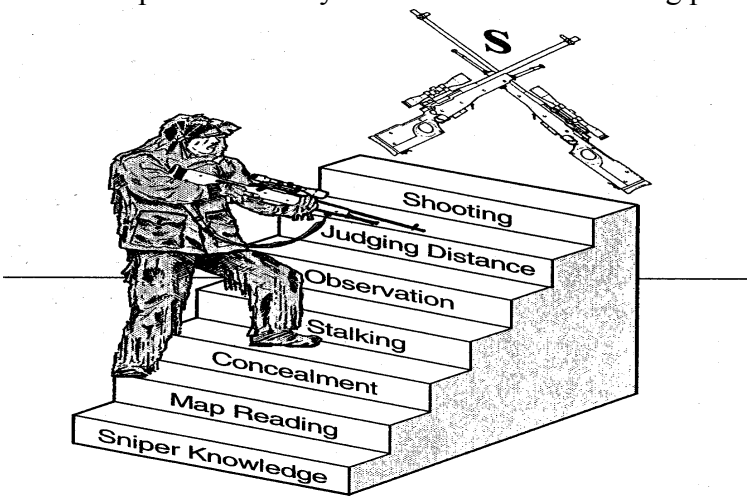
Part 5

Sniper

Marksmanship

Sniper Marksmanship

During Sniper Missions, there will be times when you will have to engage a target during periods of limited visibility or darkness with or without Night Vision Devices or Artificial Illumination. It is during these times that your skill with your SWS and the rifle Scope will determine the success of your mission .
The shooting part of sniper training is the most essential of the sniper's training but it is based on the rest of the sniper skills that you can see in the following picture .



Scope Description and Use

During this shooting part of the training , the use of the scope of the SWS is essential . The scope mainly puts on the same plane the target's image and the aiming device (reticle), making easy all the aiming's procedures, avoiding all the problems related to the use of the front and rear sight of the weapons. The primary advantages of telescopic sights are :

1. Ability to magnify the target and the existing light .
2. Allows for rapid and accurate aiming.

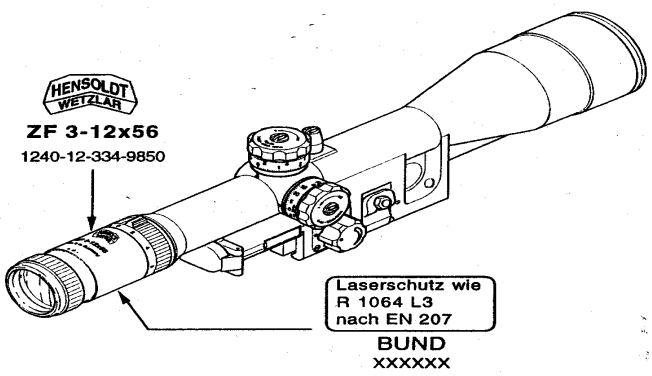
Because you can see the target more clearly and it seems much closer, it does not means you are automatically a better shooter . You must still employ the marksmanship principles. Some disadvantages of the telescopic sights are :

1. Small sighting errors can mean big misses .
2. The sight is the most fragile part of the weapon .

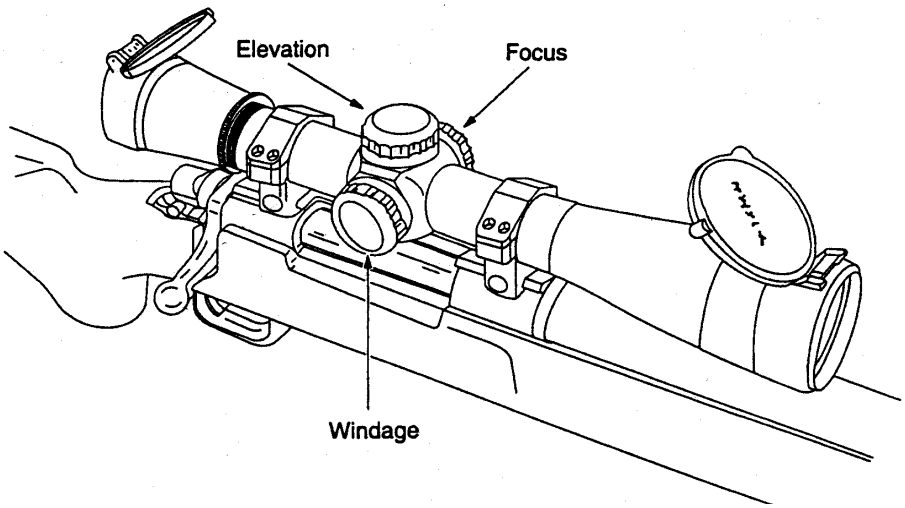
A scope is composed mainly by a metallic tube called **body** (with a diameter size of 1 inch for the USA model or 30 mm for the europeans) .
The 1 inch body allow a magnification of about 3 times its diameter, the 30 mm body can magnify 4 times its size .
It also gives a better quality immage because the light doesn't have to bent too mach inside the tube .

The main scopes that the ISTC is using are :

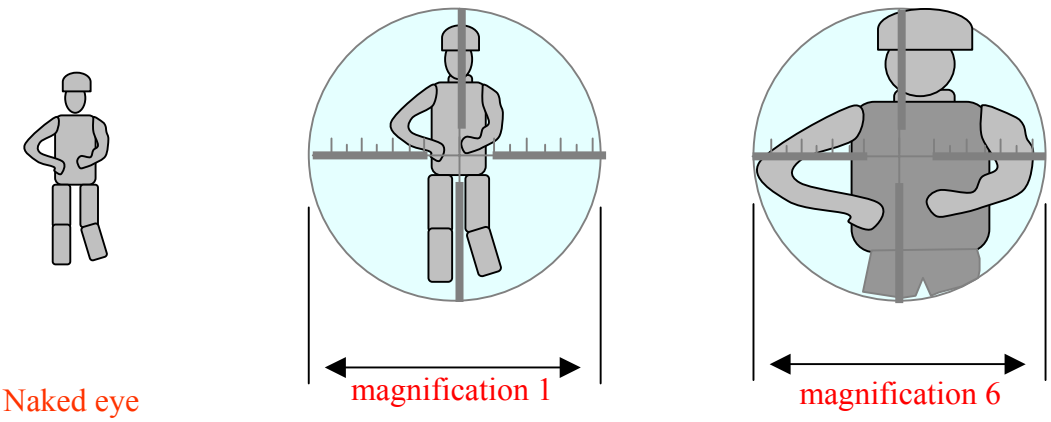
1. ZF 3-12x56 for the G22 SWS



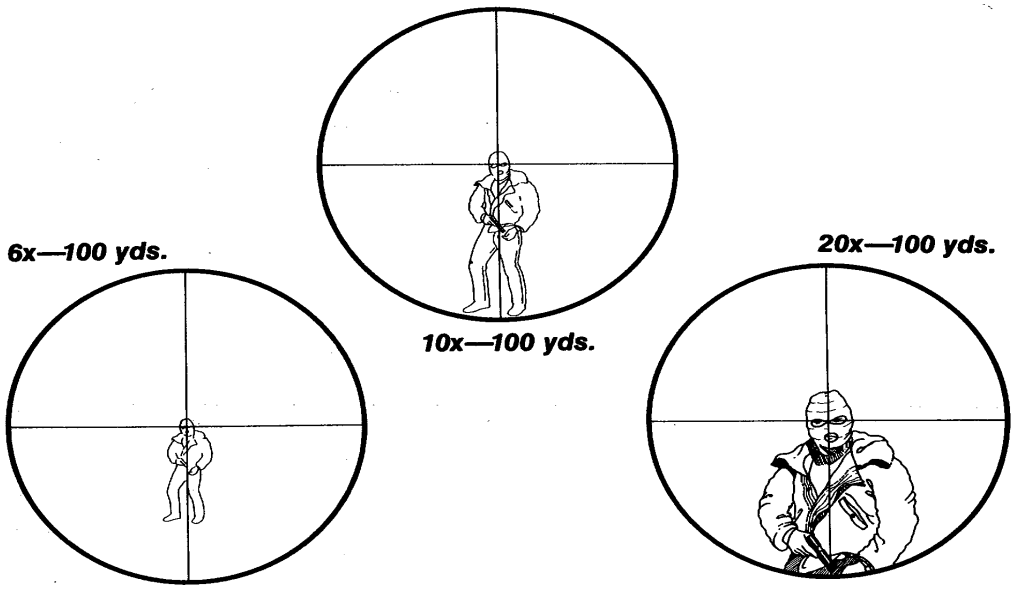
2. Leupold & Stevens M3A Scope (magnification 10x) for the M24 SWS.



The first two of the numbers that are describing each scope , correspond to how many times the object is **magnified** and it is also related to the diameter of the scope's body.
In the next picture there is an example for a scope with magnification 1-6 x ……



In the next picture there is an example with magnification 6-20 x ….. for the distance of 100yds .



Field of view is the diameter of the field of view you are able to see trough the scope at a given distance, the bigger the magnification power,the smaller the field of view.The second number is giving the diameter of the **Entrance pupil** of the scope . The scope contains two or more lens groups and the reticle with his adjustments devices generally positioned on the centre of the body Nr (9).The entrance pupil is the one who determines the field of view .

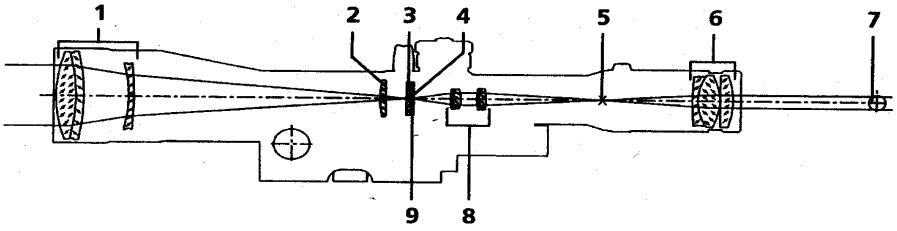


Illustration 6 Optical Structure

1 Objective
2 Field lens
3 Index reticle
4 1st image plane
5 2nd image plane
6 Eyepiece
7 Exit pupil
8 Lens of magnification adjustment
9 Aiming reticle

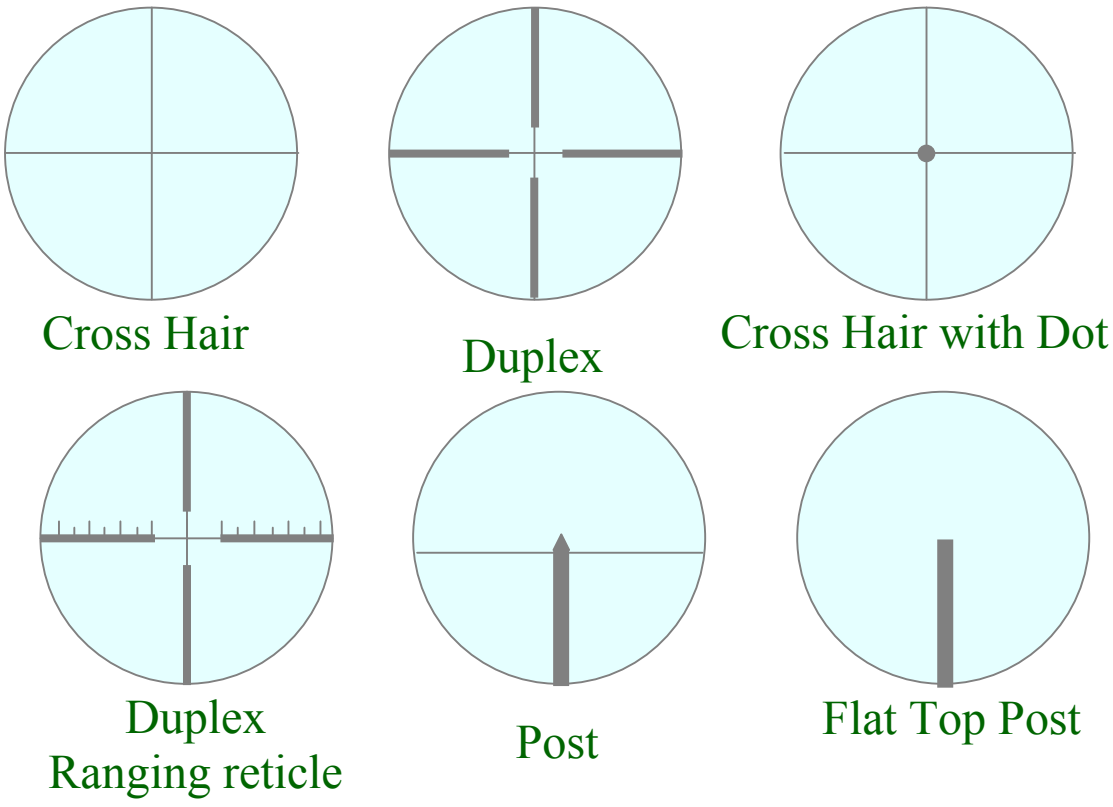
Focusing (see Sight Adjustment and Zero).
Properly focused , a scope should present both the field of view and the reticle in a sharp detail .
While looking through the scope move your head right and left . If the reticle appears to move then **Parallax** is present .
Parallax is the apparent movement of an object as seen from two different points not on line with the object .This refers specifically to an object being observed through the rifle scope that appears to move in relation to the reticle .This is caused by the object's image not being focused on the same focal plane as the scope's reticle .

Parallax for the G22 rifle is set on 500 m . Leopold & Stevens M3A scope has a field parallax adjustment knob .
The sniper should adjust the focus knob until no parallax is present . When proper eye relief and stock weld are used then parallax become an insignificant factor .

Objective (frontal lens) : The diameter of this lens is very important, it determines the amount of light entering the scope; for a use in daylight, a diameter of 20-30 mm is enough, to use a scope in twilight condition it is necessary a lens with a bigger diameter.

Coating : is a chemical treatment given to the objective lens in order to reduce reflections and allow a bigger amount of light entering the scope, similar result is also possible with special films applied on the lens.

Reticles : There are a lot of different kind of reticles like these on the next pictures :



1. Cross Hair : Good reticle, it doesn't covers the target, but if it is too thin, it will be difficult to see it in condition of poor visibility.

2. Duplex :Good reticle, easy to use also in twilight conditions.

3. Duplex Ranging reticle : Good reticle, same characteristic of the Duplex, it allow range estimation.

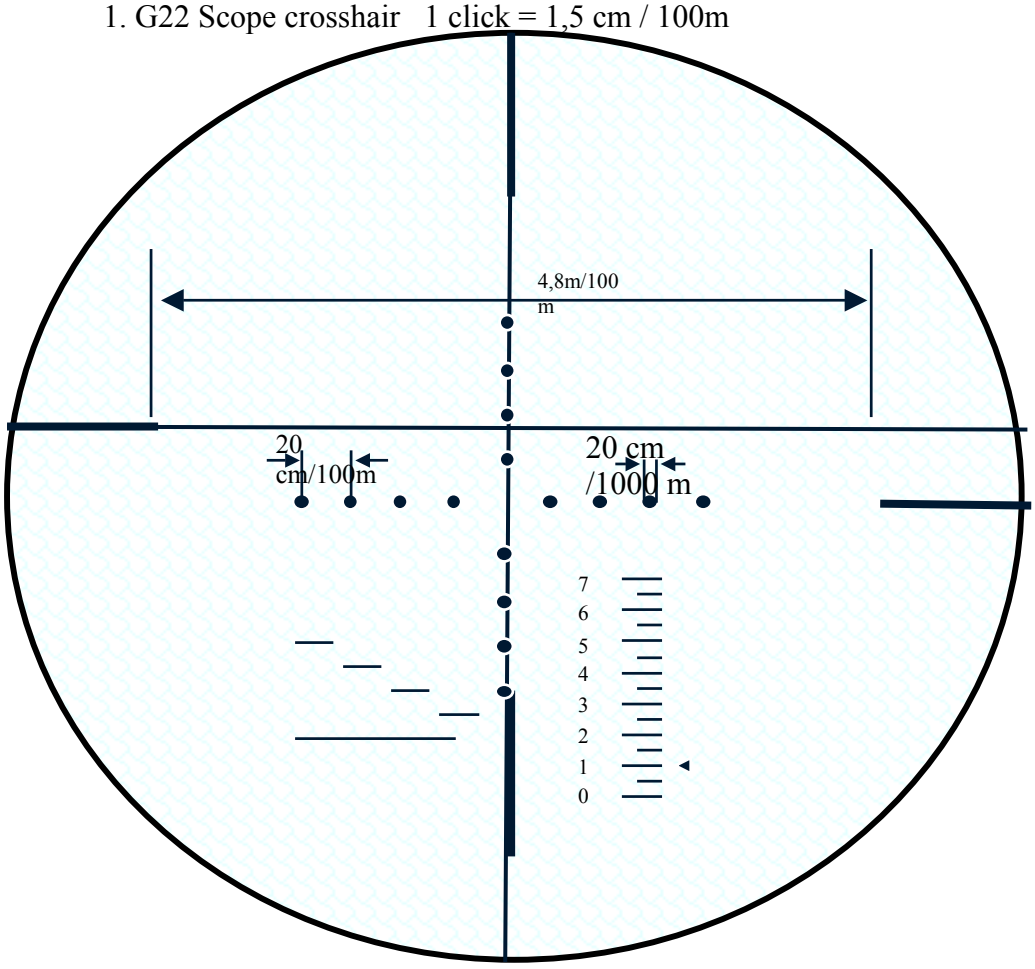
4. Cross Hair with Dot : Difficult to see the reticle in poor light condition, the dot in the center cover the target.

5. Flat Top Post :Same charatteristic of the Cross Hair with Dot.

6. Post : Even if not at the same level of the first three, the Post guarantee a good vision and doesn't cover the target.

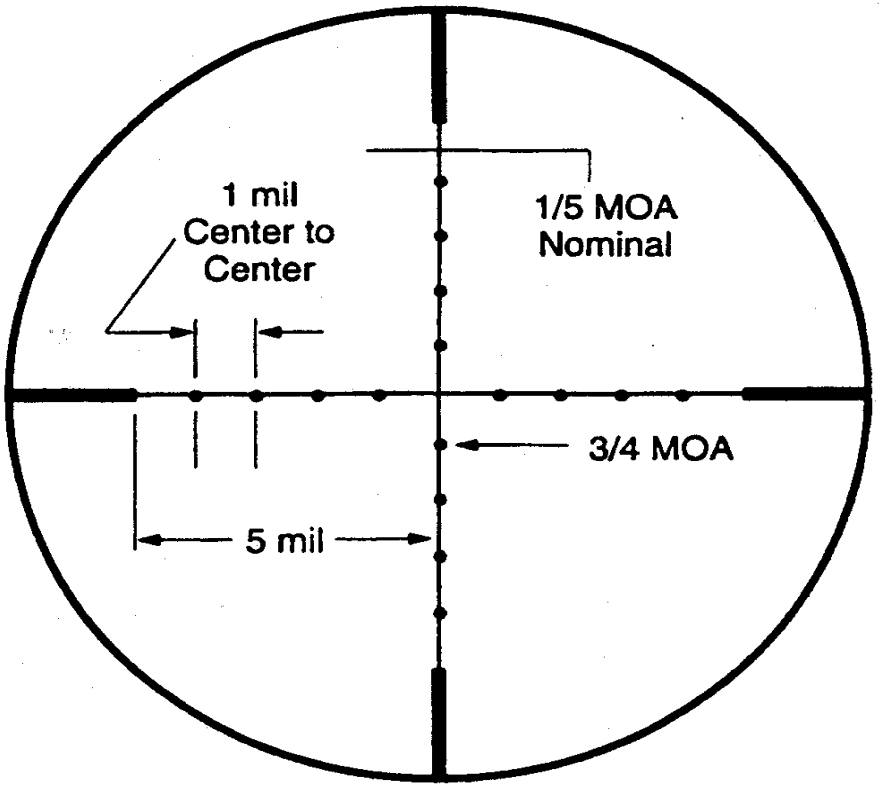
Crosshairs –Reticle :

1. G22 Scope crosshair 1 click = 1,5 cm / 100m



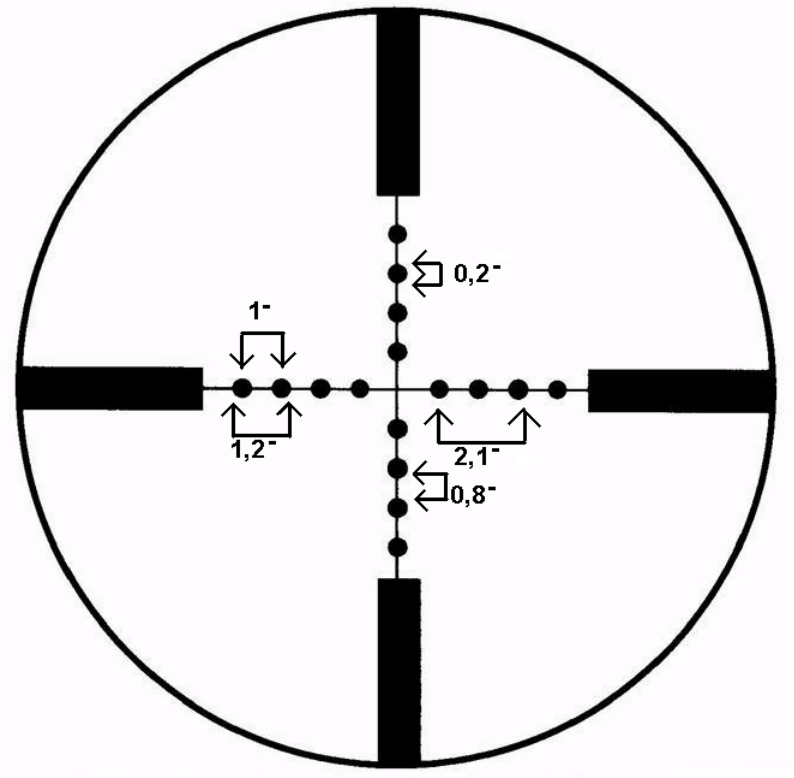
20cm/100m=2mils 20cm/1000m=0,2mils

2. Leupold & Stevens M3A Scope's reticle



1mil=3,375MOA =>1MOA=0,3mils=>3/4MOA=0,23mils

3.Smitt & Bender reticle



Scope Firing Positions –Important Points

There are three elements of a good position:

1. **Bone Support** : sniper's bone position must operate like foundations for the rifle .

2. **Muscular relaxation** : Sniper must learn to relax as much as possible in the various firing positions because muscle strain or tension causes trembling ,which is transmitted to the rifle . However in all positions a certain amount of controlled muscular tension is needed .

3. **Natural Point of Aim** :In aiming the rifle becomes an extension of the body , so it is necessary to adjust the body position until points naturally at the target . To avoid the use of muscles to aim at a target , the sniper must shift his entire firing position to move his natural POA to the desired POI .

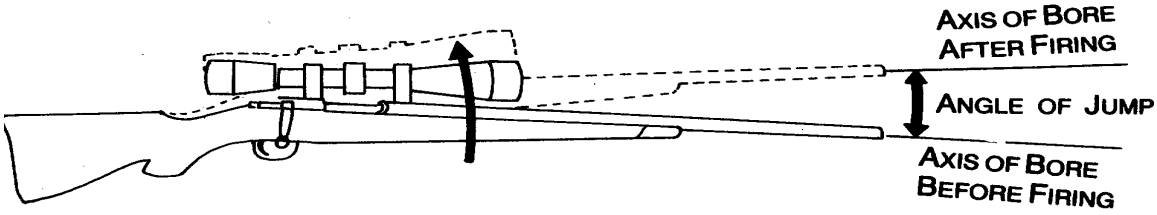
The sniper reaches this point by doing the following steps :

1. Assume a good steady position
2. Close both eyes and relax as if preparing to fire .
3. Open both eyes to see where the weapon is aiming .
4. Leave the non firing elbow in place and shift the legs , torso , and firing elbow left or right .
5. Repeat the process until the weapon points naturally at the desired POI .

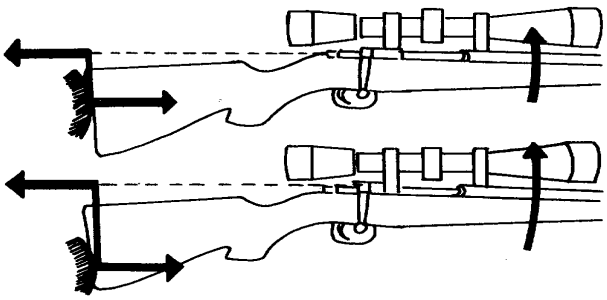
Factors Common to All Positions

1. **Nonfiring hand** : Never grasp the the forestock with the nonfiring hand . Let the weapon rest on the nonfiring hand .Ball the hand into a fist to raise the butt or loosen the fist to lower the weapon's butt .

2. **Placement of the rifle Butt** : Place the rifle butt firmly in the pocket of the shoulder .



Angle of jump



Dependence of the angle of jump on the shooter's position

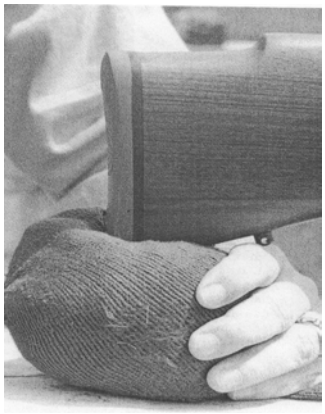
3. **Firing Hand** : Grasp the small of the stock firmly but not rigidly with the firing hand .Place the index finger on the trigger , ensuring that it does not touch the stock of the weapon and will not disturb the lay of the rifle when the trigger is pulled .

4. **Elbows** : Find a comfortable position that provides the greatest support .

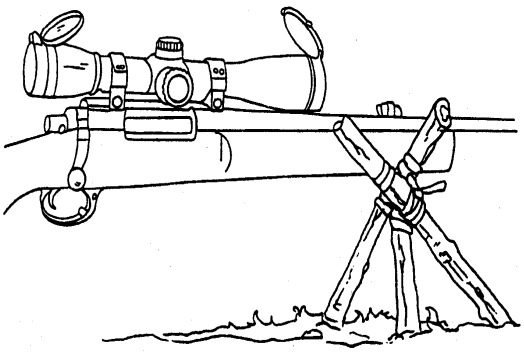
Stock weld : The stock weld is the point of firm contact between the sniper"s cheek and the stock . The cheek is placed on the stock in a position that gives proper eye relief . It differs from position to position .An important point is to get firm contact so that the head and the weapon recoil as one unit .

The SWS can be supported by various ways :

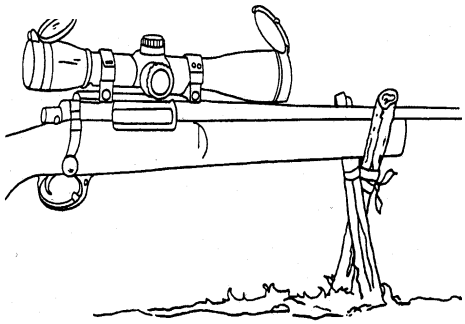
1. Sand Sock



TRIPOD



BIPOD

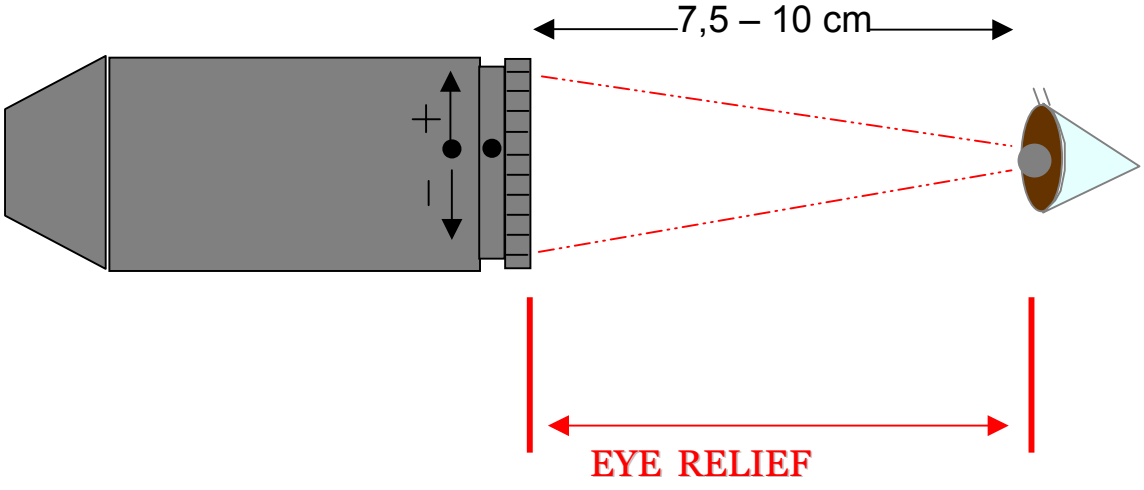


2. Rucksack - LBE
3. Sandbag
4. Drag bag
5. Tripod
6. Bipod
7. Forked Stake

Sighting and aiming

Sighting and aiming is consisted from the following :

1. **Eye relief** is the distance from the sniper's firing eye to the rear sight or the rear of the telescope tube .



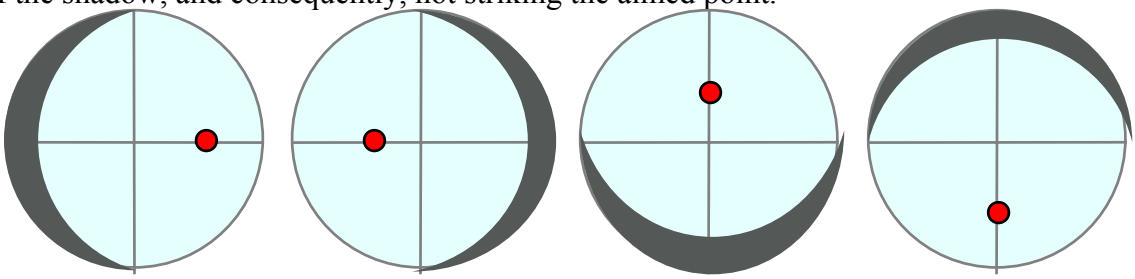
Eye relief will vary from firing position to firing position and from sniper to sniper according to :
Sniper's neck length
His angle of head approach to the stock
The depth of his shoulder pocket
His firing position

2. **Sight Alignment**

Sight Alignment is the relationship between the crosshairs and a full field of view as seen by the sniper .The most common mistakes are :

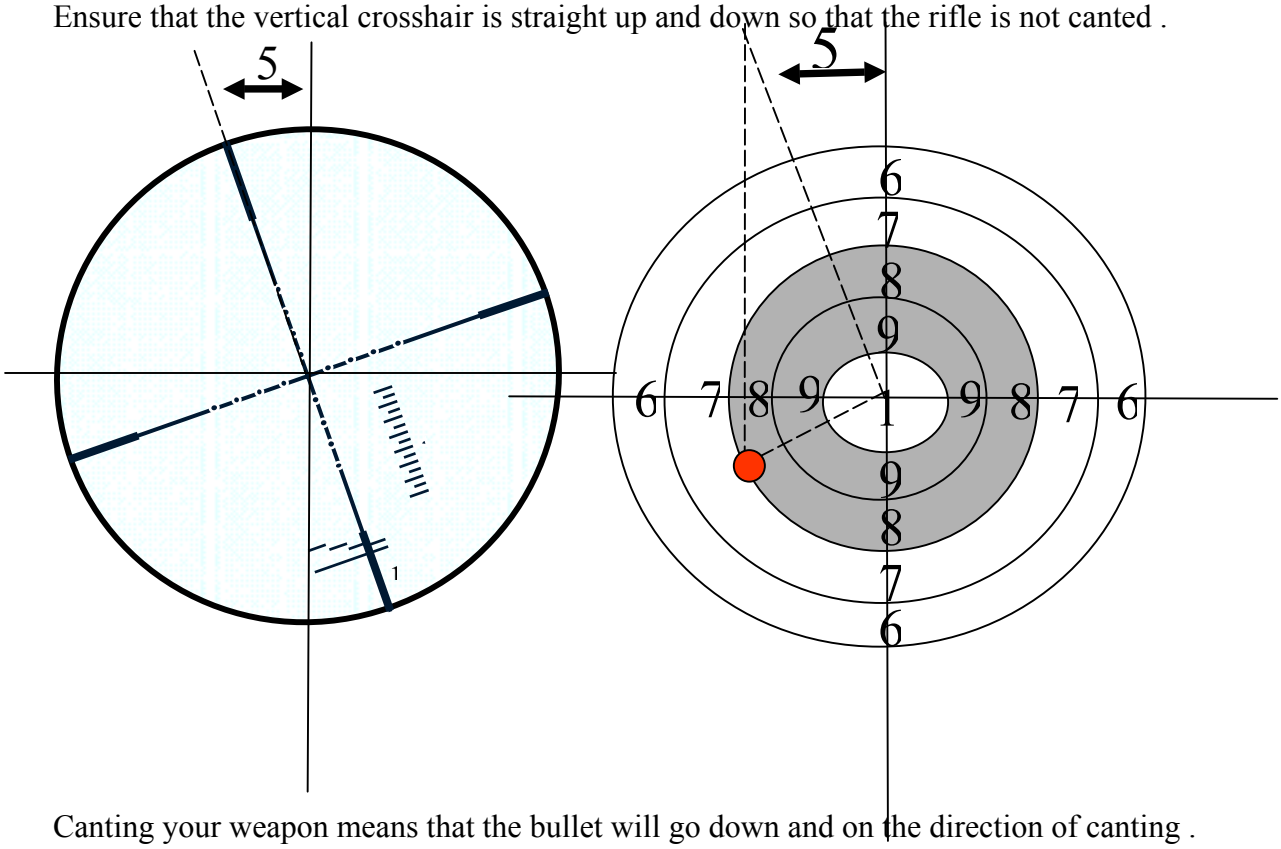
a. **Shadowing**

This condition is when the object observed trough the scope is not perfectly aligned with the axis of the scope, it is highlighted by the presence of a shadow on one side of the reticule, its results will be an error of the point of impact of the bullet at the opposite side of the shadow, and consequently, not striking the aimed point.



b. **Canting**

Ensure that the vertical crosshair is straight up and down so that the rifle is not canted .



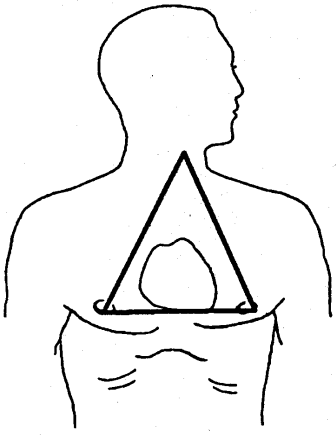
Canting your weapon means that the bullet will go down and on the direction of canting .

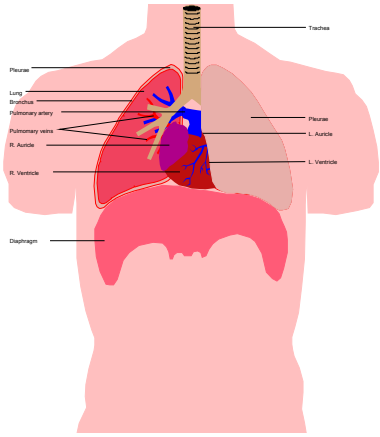
3. **Sight Picture**

Sight Picture is the correlation between the reticle and full field of view and the target as seen by the sniper .

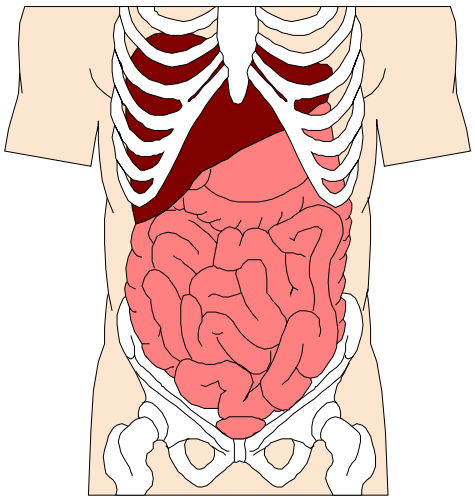
The sniper centers the reticle in a full field of view . He then places the reticle center on the largest visible mass of the target. Then he concentrates on the reticle center not the target .

4. **Point of Aim**The best POA is anywhere within the triangle formed by the base of the neck and the two nipples.





Optional POA if the upper chest is not available is the centerline below the belt



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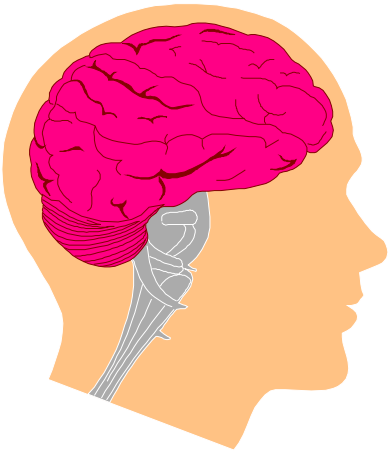
For head-shots try to hit the brain stem , the location where the spinal cord connects to the brain .



Follow Through

Follow Trough is the act of continuing to apply all of the sniper marksmanship fundamentals as the weapon fires and immediately after it fires . Follow through is consisted of :

1. Keeping the head in firm contact with the stock
2. Keeping the trigger finger all the way to the rear
3. Continuing to look through the scope tube .
4. Keeping muscle relaxed .
5. Avoiding reaction to recoil .
6. Releasing the trigger only after the recoil has stopped

Calling the shot

Calling the shot is being able to tell where the round should impact on the target .
Proper follow-through will aid in calling the shot . The dominant factor in shot calling is where the reticle is located when the weapon discharges . This location is called the **Final Focus Point** . Using the clock system from the center of the target , the shooter tells the observer where he believes the shot will go(6 o'clock , 1 mil or 20cm) .The shooter does not guess . The shooter does not ask the observer where the bullet impacted on the target , he tells the observer.

Sequence of events A recommended sequence of events is :

1. Natural point of aim
2. Clarify Target – Focus – Parallax
3. Inhale (or exhale) and hold
4. Take up the slack of the trigger
5. Put the crosshair on the exact aiming point
6. Squeeze the trigger
7. Follow through
8. Call the shot

Part 6

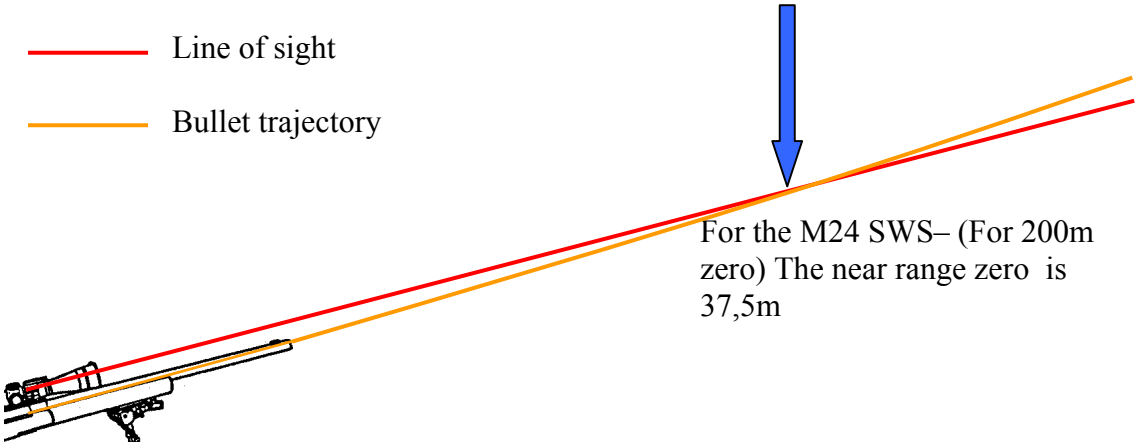
Sight Adjustment and Zero

Sight Adjustment and Zero

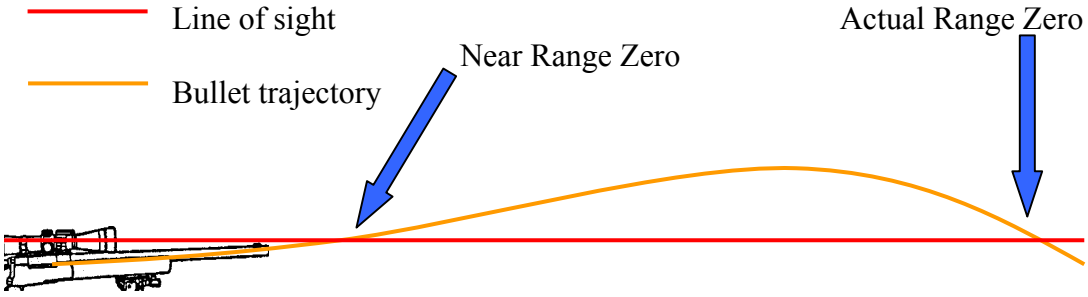
Once the sniper detects an error, he must be able to make the right correction instead of guessing or bouncing around a target. This is particularly important when correcting for a miss when he only has a short time for a second shot.

Zero : Is no more than the alignment of the sights with the bore of the rifle so the bullet impacts on the target at the desired point of aim.
The sniper has to adjust the sights for elevation and windage .
There are two different kinds of zeroing your rifle :

Near Range Zero : is where the bullet trajectory first crosses the line of sight of the weapon (the rising branch of the trajectory) . This is a very useful target distance in which to do preliminary sighting so that the first few shots at least "hit paper" .



Actual Range Zero : is the second point where the bullet crosses the line of sight (the falling branch of the trajectory) .This technique is most commonly used if the weapon has been properly boresighted .



Try always to achieve a no wind zero **.**
This is the ISTC recommended procedure for zeroing scopes :

1. Focus Crosshairs : Look through your scope at the sky or at a blank wall and check to see if the reticle appears sharp and crisp .If the reticle is not sharp and crisp , adjust the eyepiece until you achieve the desired focus .

2. Check the scope knobs – clean the bore with a dry patch .

3. Bore sight the weapon at 100-150 m .

4. **Set parallax** : (if there is a knob for this on your scope) .

5. Shoot one round : When it impacts on target, keep score on the desired impact area. Hold weapon as steady as possible and adjust the scope from the desired impact point to actual hole.

6. Shoot a 5 round group and calculate the error of the MPI and adjust the elevation and windage turret to the desired correction .

7. Fire another 5 round group(or additional 5 round groups) until the desired MPI is achieved .

8. Confirm zero with a final 5-round group .

To bore sight your rifle follow the next steps :

1. Remove the bolt from the weapon .

2. Support the weapon on something stable

3.Place the weapon on target through the bore (100-150m)

4.Look through the scope and adjust it

To give corrections in inches or cm you need to know the target size and then estimate the distance from the POA to the POI .
Then convert in or cm in MOA or clicks :
1 click = 1MOA – Elevation } M3A
2 clicks = 1 MOA - Windage }
1 click = 1,5 cm at 100m – Elevation } G22
1 click = 1,5 cm at 100m - Windage }

To give corrections in mils use your scope's reticle to measure the distance from the POA to the POI . Then convert in or cm in MOA or clicks :
1 mil = 3,375 MOA => 1.1 x 3,375 =
= 3.7 MOA = 4 MOA (M3A)
Example for the G22 scope : POI is 2,2 mils Left & 0,5 mils Down on a target at 500m .
1mil=50cm =>2,2mil=110cm }
1click=7,5 cm } =>110/7,5=15click right

1mil=50cm =>0,5mil=25cm=>25/7,5=3clicks up.

The scope of the G22 SWS has 2 knobs. The top one is for elevation adjustments and the right one for windage adjustments .
The M3A scope has 3 knobs . The one on the left side is for parallax settings , the top one is for range adjustments and the right one is for windage adjustments .
After finishing with the elevation and windage zero :
Loose the elevation knobs screw and slip the scale to 200m(M3A) – 5(G22) .
Loose the windage knobs screw and slip the scale to zero .

Cold Bore Shot : Some rifles will inherently shoot to the left or to the right on the first few shots .If your rifle does this , it is important that you know where these shots go . As the rifle barrel heats up or gets fouled ,the zero will be reestablished . When a rifle is super cleaned , copper and lead are removed from the barrel's imperfections , pits and scratches . The first few shot fired through the barrel refil these imperfections . The bullets are affected by this , and subsequently changes from the zero are seen . Before you go to a mission where first round hits are a critical must , recheck your zero and leave the rifle barrel fouled . Sometimes even when a rifle barrel is fouled , if the rifle is cold , it will shoot differently for the first round . This must be logged and remembered . Each time you take a cold bore shot , ensure it is logged in the shooter's log . In most cases , however , a fouled rifle will show no difference between a cold bore shot and a warmed-up shot .

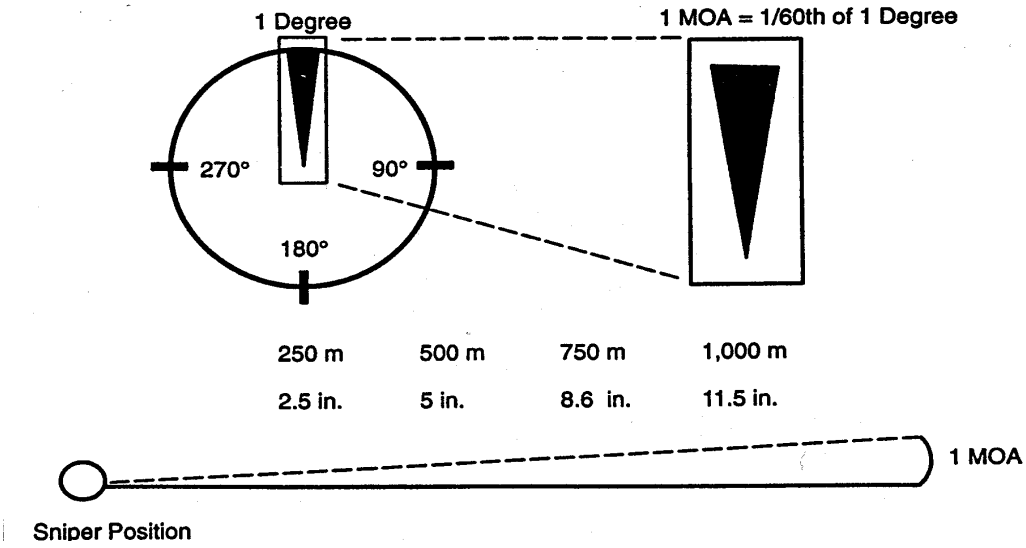
Part 7

Application of Fire

Application of Fire

Calculating a Minute of Angle

MOA is the unit of angular measure that subtends 1/60 of 1 degree of arc.



This is how we convert the MOA to mils and to in or cm:

1 MOA = 1/60 of 1Degree
1 Degree = 60 MOA
1 Degree = 17,8 mils
}=>17,8mils=60MOA=>

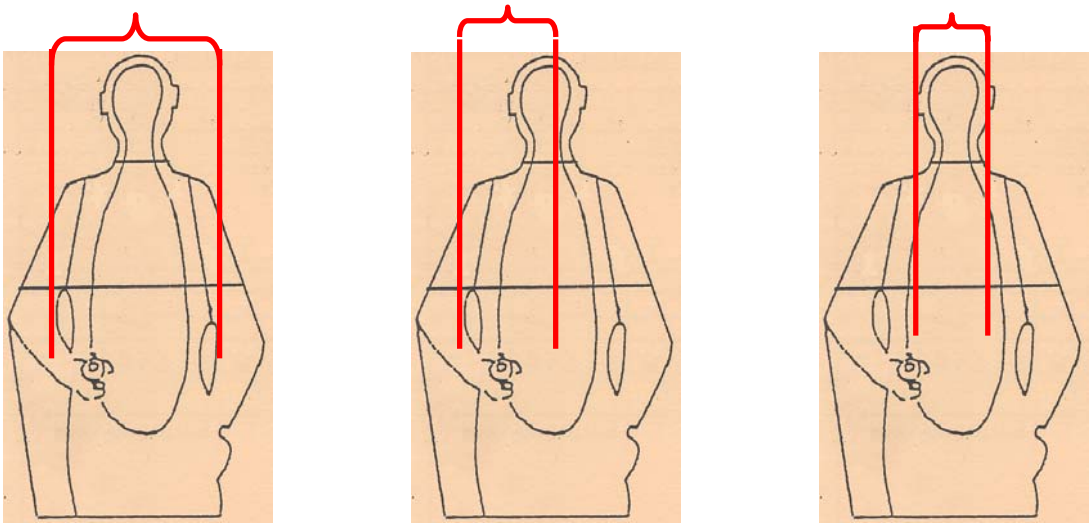
=>1mil = 3,375 MOA => **1 MOA = 0,3 mils**

1 MOA = 1 in at 100 m = 3 cm at 100 m

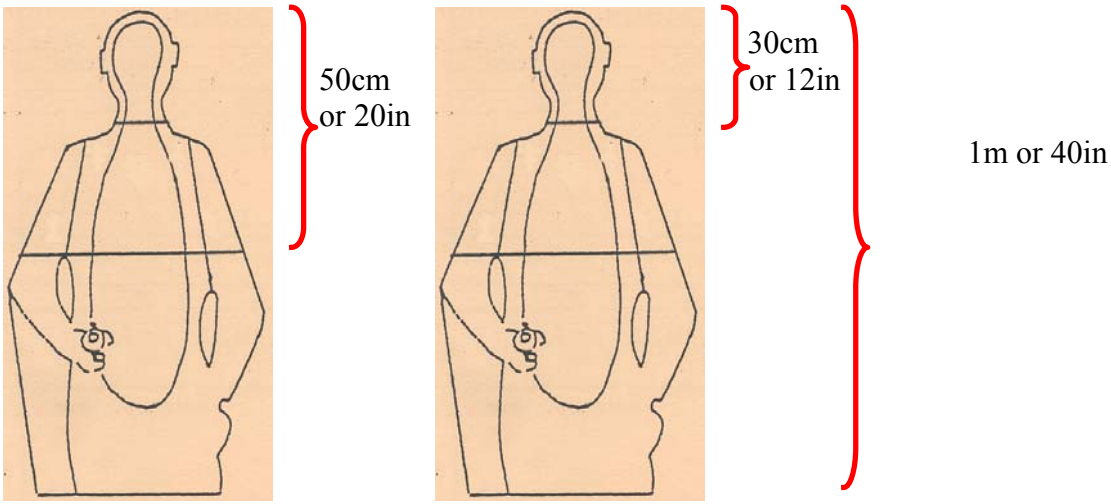
MOA corresponds to the clicks on the M3A scope.
We need this because corrections are given in in-cm.

$$\text{MinutesOA} = \frac{\text{ERROR (inches)}}{\text{MOA-RANGE (in whole numbers)}}$$

50cm or 20in | 25cm or 10in | 20cm or 8in



Example 1: POI at 400m is observed to be 25cm=10in left of POA
M24 => MOA = 10in / 4 = 2.5 MOA
= 5 clicks on your scope windage knob
G22 =>1 click = (4 x 1,5 cm) = 6 cm => 25cm /6cm = 4 clicks on your scope .

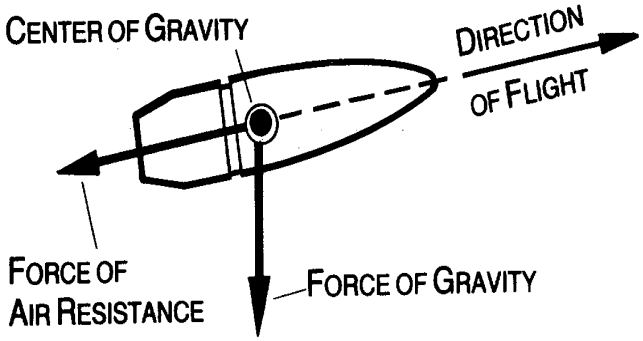


Example 2:
At 500m POI is observed to be 15 in or 40 cm over the POA.
MOA = 15 / 5 = 3 MOA = 3 clicks **(M24)**
1click = (1,5 cm x 5) = 7,5 cm => 40cm / 7,5cm = 5 clicks **(G22)**

Ballistics :
Ballistics is the study of the projectiles in motion.
It can be broken down to three major areas:

1. **Internal Ballistics** - starts with the primer in the rifle until it leaves the bore/muzzle

2. **Exterior Ballistics** - picks up after the bullet leaves the muzzle and extends through the trajectory until the bullet impacts. Forces that act on a bullet are:
   a. **Gravity**
   b. **Air Resistance**



Gravity is a constant force on the bullet and if there were not the influence of the air-resistance the form of the trajectory would be a parabola
Air Resistance is the most important variable affecting the flight of a bullet so both gravity and air-resistance cause the trajectory to be ellipse (angle of fall is steeper than angle of departure).

Trajectory: Is the path the bullet takes through the air. The form of the trajectory is influenced by

a. **Initial Velocity** (Ammo -rifle)

b. **Gravity**

c. **Air Resistance**

d. **The Angle of Departure,** which can be influenced by:

1/. Internal ballistics (Ammunition)

2/. Imperfections in the human eye

3/. Imperfections in the weapon

4/. Errors in the way the weapon is held or canted

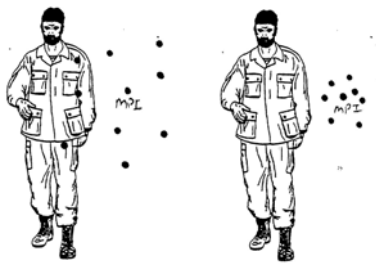
e. **Rotation of the Bullet**

Maximum Ordinance is the point of the trajectory that the bullet starts to fall.
Rising Branch is the part of the trajectory starting from the muzzle to maximum ordinance.
Falling Branch is the part of the trajectory starting from the maximum ordinance to the impact of the bullet.
The distance in front of the muzzle, within which the bullet does not rise higher than the object fired at, is called **the danger space** of the rising brunch of the trajectory. The danger space of the falling branch is the point where the bullet falls into the height of the target and continues to the ground. Assuming that the POA is taken at the center of the target, the extent of the danger space depends on the:

a. Height of shooter
b. Height of the target
c. "Flatness" of the trajectory-ballistics
d. Angle of the line of sight - above and below the horizontal
e. Slope of the ground: Level, slope upward or downward

3. **Terminal Ballistics** - what the bullet does upon impacts on the target.

There are two kinds of shot groups: **circular** & **elliptical**
Dimensions of the shot groups increase when distance increase. Shots will be grouped more densely near the center. ¨Half of the shots will be found in a box approximately ¼ the size of the whole group. The sizes of this box are called**: ¨Mean Vertical – Mean Lateral**
For a Shot Group the center of impact is not necessarily the Point of Aim .For large targets all rounds should impact on them. For small targets, portion of them will impact on the target. With practice you will conform your shot group to the dimensions of a given target.
Paradox of sniping: Good Shooter (right) can miss a target that a bad shooter (left) might hit!



Methods Used for Indicating Targets:

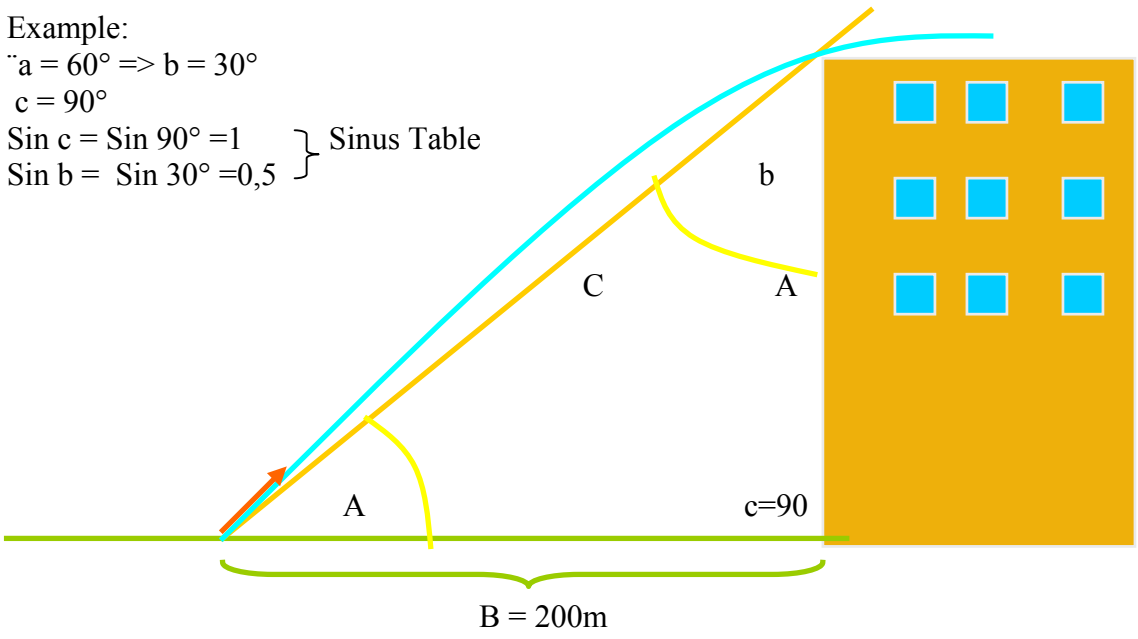
1. **Clock Ray Method**
Example: 12 o'clock, 200m, helmet over the ground-line

2. **Direct Method** (Obvious Targets)
Example: single man, 300 m, straight ahead

3. **Reference Point Method** (less Obvious targets)
A specific reference object is nominated and a name and range is given ("lone-tree / 20m left /small bush-range 400").

Slope Firing:
Unless the sniper takes corrective action, bullet impact will be above the POA when he is contacting slope firing. The steeper the angle, the more precise you must be in estimating or measuring the angle. Use the range estimation techniques to estimate the straight distance from the shooter to the target.

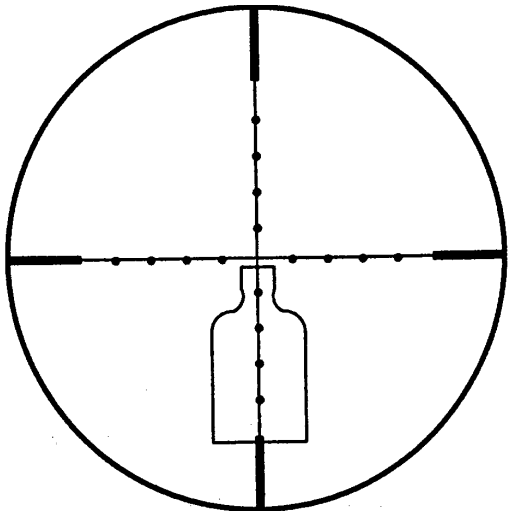
Example:
¨a = 60° => b = 30°
c = 90°
Sin c = Sin 90° =1
Sin b = Sin 30° =0,5
} Sinus Table



Sinus Formula = B / Sin b = C / Sin c = A / Sin a => C = (Sin c x B) / Sin b => C = (1 x 200) / 0,5 => C = 400 m
Next step for the sniper is to convert the actual range of 400m to the "Slope range", using the Slope firing table from his sniper Data Book. As a result, for the G22 SWS (300WinMag) he has to adjust the elevation knob to the range of 168m and for the M24 SWS (M-118) to the range of 200m.

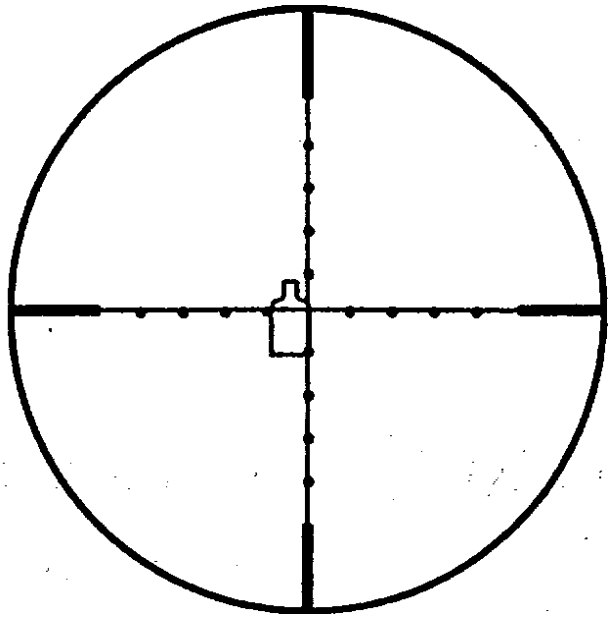
Hold-Off (Aim-off):
Hold-off is shifting the POA to achieve a desired POI. Multiple targets at varying ranges or rapidly changing winds is the reason for using the Windage & Elevation Hold-off techniques

1. **Elevation Hold-Off (Holdover & Holdunder)**



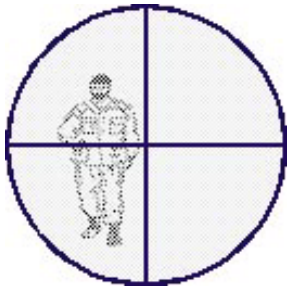
The sniper rarely achieves pin point accuracy when holding off, because a minor error in range determination or a lack of a precise aiming point might cause the bullet to miss the desired point.
Sniper uses the elevation hold off only if multiple targets at varying ranges appear or time does not permit him to adjust the scope or when he knows that an enemy sniper is searching for him through his scope and so no movement is permitted.
The sniper can use his "Fixed Scope Reference in mils Table " from the Sniper Data Book to calculate the appropriate Hold-off for every occasion.

2. **Windage Hold-Off**



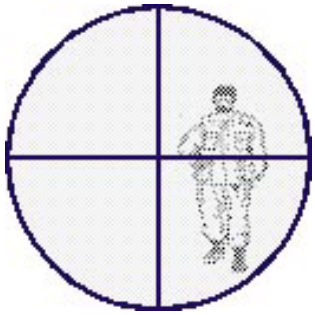
Sniper uses the windage hold off to compensate the wind effects or when there is no time for scope corrections or when he knows that an enemy sniper is searching for him through his scope and so no movement is permitted.

When holding off the sniper aims into the wind.



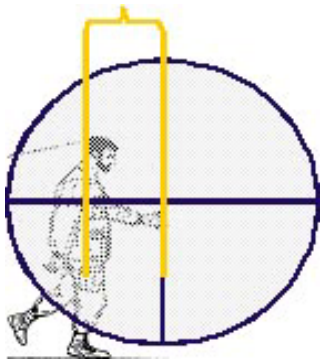
Wind

Wind



Engaging of Moving Targets

Moving targets are generally classified as walking or running and are the most difficult to hit .The distance the crosshairs are placed in front of the target's movement is called a lead. Lead



There are four factors in determining Leads for Moving targets:

1. Speed of the target
2. Angle of target movement
3. Range to the target
4. Wind effects

To calculate the lead we use the following formula:

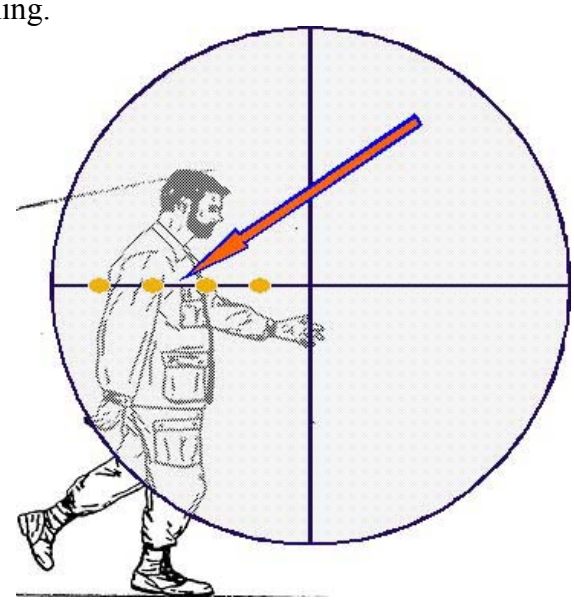
Time of flight (sec) x Target speed (mps) = Lead (m)

$$\frac{\text{Lead (m)} \times 1000}{\text{Range to target (m)}} = \text{mil Lead}$$

It is not recommended for snipers to engage movers beyond 400m.

To engage a moving target use the following techniques:

1. **Tracking** :(Most Difficult To Master)
The sniper must move and keep the reticle in front of the target. He also must have a smooth platform to engage the target from. It is the most difficult technique and requires a lot of training.



2,5 Mils Lead (M3A) – 5 Mils Lead G22 scope

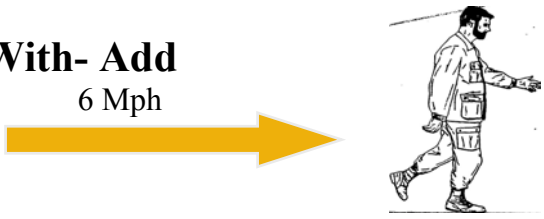
2. **Trapping or ambushing**
The sniper selects a point in front of the target, when the target reaches that point (it can be a point on the ground or on the crosshair) he fires the weapon .

Moving Targets – Wind corrections
If the wind is behind the moving target we add the wind correction to the Mil-Lead of the moving target. If the wind is in front of the moving target we subtract the wind correction to the Mil-Lead of the moving target.

Example (US): 6 Mph wind left to right, lead of 1 1/4 mil from left to right
The range is: 300 Meters
Wind Formula=(RxV)/C=(3x6)/10=1,8MOA= =1,8/3,375 mils=0,53mils

With- Add

6 Mph

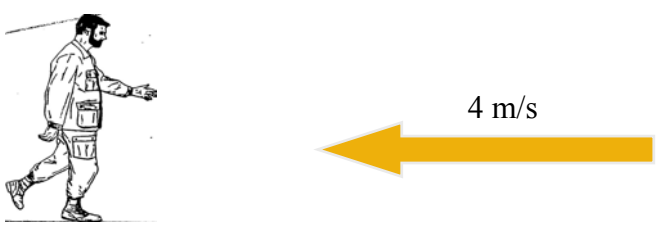


1 ¼ + ½ = 1 ¾ Mil Lead

Example (EU): 4 m/s wind right to left, lead of 1,25 mil from left to right
The range is: 300 Meters
Wind Table for G22 SWS gives us for the range of 300m and Wind Velocity of 4 m/s that the Hold-off is 0,3 mils.

Against-Substract

1,25 - 0,3 = 0,95 Mil Lead



4 m/s

Part 8

Correction for meteorological conditions / reading wind and spotting

CORRECTING FOR METEOROLOGICAL CONDITIONS

In the case of the highly trained sniper, effects of weather are a primary cause of error in the strike of the bullet. Wind, mirage, light, temperature, and humidity all have effects on the bullet, the sniper, or both. Some effects are insignificant, depending on the average conditions of sniper employment. However, sniping is often accomplished under weather extremes, and therefore all effects must be considered to ensure a first-round hit.

As a sniper you must be able to compensate for the effects on bullet deflection of

(1) Wind.

(2) Mirage.

(3) Temperature.

(4) Light.

(5) Humidity and altitude.

a. The condition that constantly presents the greatest problem to the sniper is the wind. Wind has a considerable effect on the bullet that increases with range. This is due primarily to increased air resistance as the bullet's velocity is reduced and results in the loss of stability. Wind also affects the sniper's ability to hold his rifle steady.

b. Before any sight adjustments can be made to compensate for the wind, you must determine wind direction and velocity. Range flags, smoke, trees, grass, rain, and the sense of feel are the indicators that the sniper may use to accomplish this.

c. A common method of estimating the velocity of the wind (in training) is based on observation of the range flag. The angle in degrees between the flag and its pole is divided by the constant number 4. If no flag is visible, the sniper may drop a piece of paper, grass, or some other light material from the shoulder. By pointing directly at the spot where it lands, he can calculate the approximate velocity in miles per hour (mph).

d. If the above methods cannot be used, the following information is helpful in determining velocity:

(1) Winds under 3 mph can hardly be felt, but may be determined by smoke drifts.

(2) A 3- to 5-mph wind can just be felt on the face.

(3) In a 5- to 8-mph wind, leaves in trees are in constant motion.

(4) An 8- to 12-mph wind raises dust and loose paper and moves small branches in trees.

(5) In a 12- to 15-mph wind, trees begin to sway.

e. Since the sniper must know how much effect the wind will have on the bullet, he must be able to classify the wind. The universally accepted method is by use of the clock system. A half-value wind will affect the strike of the bullet approximately one-half as much as a full-value wind of the same velocity. A wind velocity corrected in this manner is called the "effective wind." The so-called no-value wind has a definite effect on the bullet at long ranges if the wind is not blowing directly from 6 to 12 o'clock. This is the most difficult wind to fire in due to the switching or "fishtail" effect, which requires frequent sight changes. Depending on the velocity of this type wind, it may have a slight effect on the vertical displacement of the bullet.

f. After the sniper determines wind direction and velocity, he must place the windage correction on the sights. The windage correction will be based on the following formula:

$$\frac{R \times V}{10} = MOA$$

For a half-value wind, simply divide the answer by 2.

In this formula R = Range in hundreds of meters and V = Velocity of the wind in MPH. MOA = Minute of Angle. The constant 10 was arrived at mathematically considering the bullet weight, the density, the velocity, the air resistance, the distance to targets, and the rear sight movement.

EXAMPLE: The wind is blowing from 9 o'clock at 10 mph. The range is 300 meters. Using the wind formula, R=3 and V=10——

$$\frac{R \times V}{10} = \frac{3 \times 10}{10} = 3 \text{ MOA}$$

g. The formula for a standard issue rifle and ammunition (M880 ball) is——

$$\frac{R \times V}{15} = \text{Full-minute clicks}$$

EXAMPLE: The wind is blowing from 9 o'clock at 10 mph. The range is 300 yards. Using the wind formula, R=3 and V=10——

$$\frac{R \times V}{15} = \frac{3 \times 10}{15} = 2 \text{ clicks}$$

In the event the answer is a fraction, use the nearest whole click.

h. For ranges beyond 500 yards, the constant 15 changes due to bullet velocity loss.

Range (yd)	Constant
600	14
700	13
800	13
900	12
1,000	11

i. When adjusting the sights in order to compensate for the wind is not possible, the sniper may use hold-off to compensate for the wind. The formula used to find the hold-off distance
is

MOA (from wind formula) x Range (nearest hundred) = Hold-off in inches.

NOTE: The wind formula must be computed first to find the MOA.

EXAMPLE: Range to target is 400 yards; wind is from 3 o'clock at 8 mph. Find the hold-off required to hit the target (M118 NM ammo).

$$\frac{R \times V}{10} = \text{MOA} \quad \frac{4 \times 8}{10} = 32 = 3.2 \text{ MOA}$$

$$\frac{C \times R}{\text{(inches)}} = \text{Hold-off} \quad \frac{3 \times 4}{} = \frac{12}{} \text{ inches right}$$

Remember, for a half-value wind, divide MOA by 2, not the hold-off.

MIRAGE

a. The word “mirage” refers to the heat waves or the reflection of light through layers of air of different temperatures and densities as seen by the naked eye on a warm, bright day. Proper reading of the mirage will enable the sniper to estimate the proper windage corrections with a high degree of accuracy.

b. When observed through the telescope, the mirage will appear to move with the same velocity as the effective wind, except when the wind is blowing straight into or away from the scope. Then the mirage will give the appearance of moving straight up with no lateral movement. This is termed a “boiling” mirage. In general, changes in velocity of the wind can readily be determined by observation of the mirage up to speeds of approximately 12 mph. Beyond that speed the movement of the mirage is too fast for detection of minor variations. In general, when the waves of the mirage are shallow, the velocity and resultant wind speed are fast.

c. The true direction of the wind may be determined by traversing the telescope until the heat waves move straight up with no lateral motion (a boiling mirage).

d. A mirage is particularly valuable in reading the so-called no-value winds. If the mirage is boiling, the effective wind velocity is zero. If there is any lateral movement of the mirage at ranges of 300 to 900 meters, it is usually necessary to make a windage adjustment.

e. Another important effect of mirage is the light diffraction caused by the uneven air densities, characteristic of heat waves. Depending on the atmospheric conditions, this diffraction will cause a displacement of the target image in the direction of the movement of the mirage. Thus, if a mirage is moving from left to right, the target will appear to be slightly to the right of its actual location. Since the sniper can only aim at the image received by his eye, he will actually aim at a point which is offset slightly from the center of the target. This error will be in addition to the displacement of the bullet caused by the wind. Since the total effect of the visible mirage (effective winds plus target displacement) will vary considerably with atmospheric conditions and light intensity, it is impossible to predict the amount of error produced at any given place and time. It is only through considerable experience in reading mirage that the sniper will develop proficiency as a “wind doper.”

f. In utilizing the telescope to read the mirage, the sniper must use the following adjustment technique. Since the wind will have the most effect on the bullet at midrange, the sniper will focus the scope at midrange in order to read the mirage at that point. To properly focus the scope for reading a mirage, he will pick out an object midway to the target and adjust the focus of the scope at that point. Without disturbing the focus, he will adjust the scope onto the target. Since the scope is focused to read the mirage, the target will appear fuzzy.

g. When using the scope reticle, the sniper may use hold-off to compensate for the wind.

(1) When using the scope reticle horizontal stadia marks to measure the hold-off distance required, the sniper must remember to first "range in" on the target. He can then subdivide the horizontal reticle line within the stadia marks (60 inches) to determine the correct distance for hold-off and also utilize that reference point as an aiming point or point of aim.

(2) When holding off, the sniper aims into the wind. If the wind is from the right, the point of aim is to the right. If the wind is from the left, the point of aim is to the left.

(3) Constant practice in wind estimation can bring about proficiency in making sight adjustments or learning to hold off correctly. If the sniper misses the target and the target and the impact of the round are observed, the sniper will observe the lateral distance of his error and refire, holding off that distance in the opposite direction.

TEMPERATURE

a. Temperature has a definite effect on the elevation setting required to hit the center of the target. This is caused by the fact that an increase in temperature of 20 degrees Fahrenheit will increase the muzzle velocity by approximately 50 feet per second.

b. Regardless of the range, the sniper must change his sights one MOA for each 20 degree change in temperature. For a drop in temperature the sights must be raised; for an increase in temperature the sights must be lowered.

LIGHT

a. The subject is very controversial, as light may or may not have an effect on the sniper's aim. The difficulty is that light affects different people in different ways; therefore, it is believed that nothing can be presented as fact. The general rule, however, is for the sniper to shoot high on a dull, cloudy day and low on a bright, clear day.

b. Extreme light conditions from the left or the right may have an effect on the horizontal impact of a shot or a shot group.

c. To solve the problem of light and its effects, the individual sniper must accurately record the light conditions under which he is shooting. Through experience and study he will eventually determine the effect of light on his zero.

HUMIDITY

a. The effect of humidity on the strike of the bullet is directly related to the amount of moisture in the air. The higher the humidity, the denser the air, and thus there is more resistance to the flight of the bullet. This resistance will tend to slow the bullet, and as a result the sniper must raise his elevation to compensate for it.

b. The effect of humidity at short ranges is not as noticeable as at long ranges. Again the experience of the sniper and his resultant study of hits and groups under varied conditions of humidity will determine the effect of humidity on his zero.

c. Elevation above sea level can have an important effect on bullet trajectories. At higher elevations both air density and temperature decrease and air drag on the bullet decreases.

M49 SPOTTING SCOPE

a. The M49 observation telescope is a prismatic optical instrument of 20-power magnification. The lenses of the telescope are coated with a hard film of magnesium fluoride for maximum light transmission. This coating, together with the high magnification of the telescope, makes observation and target detection possible when conditions or situations may otherwise prevent positive target identification. Camouflaged targets and those in deep shadows can be readily distinguished, troop movements can be observed at great distances, and selective targets can be more readily identified. For the purpose of this class we will concentrate on the telescope's secondary function as an aid in reading mirage more accurately.

b. To put the M49 observation telescope into operation, the sniper must——

(1) Unscrew the eyepiece cover cap and the lens cover.

(2) In placing the M49 telescope on the tripod, spread the legs and place the tripod on level ground or in a level position if possible. The sniper must align the hole of the flat side of the telescope with the screw on the tripod and tighten the scope. The scope is now prepared for use.

(3) Adjust the telescope on a target.

(a) Height——The height adjusting collar is used to maintain a desired height for the telescope.

(b) Direction——The shaft rotation locking thumbscrew clamps the tripod shaft at any desired azimuth.

(c) Angle——The elevation thumbscrew is used to adjust the cradle of the tripod to increase or decrease the angle of elevation of the telescope.

(d) Final adjustment——The tripod legs can be held in an adjusted position by tightening the screw nut at the upper end of each leg.

(4) In focusing the observation telescope, use the focusing sleeve located at the base of the eyepiece. Turn it clockwise or counterclockwise until you can clearly see the image.

c. The observation telescope is very important to the sniper in determining sight adjustments by reading mirage (wind conditions) or observing locations of hits so that hits can be accurately plotted in the log book.

d. For ranges of less than 300 yards, the sniper will use the telescope primarily for plotting hits. Although the telescope may be used to check mirage, experience has indicated that the wind seldom affects the bullet at a distance of less than 300 yards.

e. In utilizing the telescope to read mirage, the sniper will use the following adjustment technique. Since he is concerned with the wind between himself and the target, he should keep the focus of the telescope short of the target. For example, if he is shooting at 600 yards, he should have the focus on the 300-yard line. He must take care not to focus beyond the target, as this will sometimes produce a reverse reading of the mirage. When reading mirage while in the prone position, the sniper should position the telescope near his left elbow in such a manner that he can look through it without shifting his position.

f. Before firing, the sniper should check the mirage and make the necessary sight adjustments or hold-off to compensate for any wind. Immediately after firing and before plotting the call in the score book, he again checks the mirage. If any changes are noted, they must be considered in relating the strike of the bullet to the call. The above procedure should be used for each shot.

g. The sniper may also obtain the true direction of the wind by simply turning the telescope until a boiling mirage is seen. This will give him the true wind direction.

REVIEW/SUMMARIZE:

a. The objective of this lesson was to enable you, given an overview of the procedures to be used to compensate for the effects of wind and weather, a sniper weapon system, and related equipment, to determine how to calculate and correct for bullet deflection caused by the wind and other meteorological conditions.

b. Following are some of the points that were covered in the lesson:

(1) Your ability to call winds and take into account the various weather conditions and proper recording and study of weather effects based on experience will greatly enhance your marksmanship ability. Using the observation telescope will further assist you in observation as in reading mirage.

(2) Before any sight adjustments can be made, the sniper must know the direction and velocity of the wind.

(3) A mirage will appear to move with the same velocity as the effective wind, except when the wind is blowing straight into or away from the scope.

(4) To properly focus the scope for reading a mirage, the sniper will pick out an object midway to the target and will adjust the scope onto the target, without disturbing the focus.

(5) The sniper must change his sights one MOA for each 20 degree change in temperature.

(6) Light affects different people in different ways so the general rule is to shoot high on a dull, cloudy day and low on a bright, clear day.

(7) The effect of humidity at short ranges is not as noticeable as at long ranges.

(8) At higher elevations above sea level both air density and temperature decrease; thus air drag on the bullet decreases.

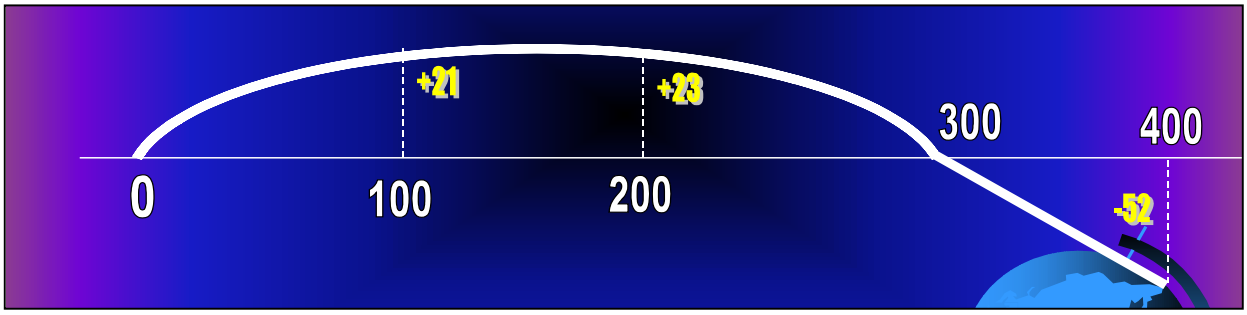
(9) The observation telescope is the most accurate telescope to make sight adjustments by reading the mirage (wind conditions) or observing locations of hits.

Part 9

Range Estimation

RANGE ESTIMATION

There are two tables below that show you how your bullet is behaving when your weapon is zeroed at 300 m (7,62 caliber). The third table is showing how your estimation error effect to your shooting.



TRAJECTORY TABLE

METERS	7,62
50	+13 CM
100	+21
150	+24
200	+23
250	+15
300	ZERO
350	-22
400	-52
450	-92
500	-143
550	-205
600	-283

EFFECT OF ESTIMATION ERROR

7,62MM

ACTUAL DISTANCE IN METERS	ROUND DROP PER 10 METER ERROR
100-200	0.20 CM
200-300	1.54 CM
300-400	3.55 CM
400-500	6 CM
500-600	8.90 CM
600-700	12.1 CM
700-800	16.2 CM

That means, if the actual distance of the target is 350m and you estimate-wrong- that the target is in a distance of 500m, the error is 150m, and the round drop will be

RD=3.55x15=53.25cm.

In order to avoid an error like this you have to estimate the range correctly. Therefore you have to learn the range estimation methods. There are four main categories:

- Estimation by Eye
- Estimation by Measurement
- Estimation with optics
- Estimation by formulation

ESTIMATION BY EYE

Before the techniques of estimation by eye, we'll refer to the factors that effect the appearance of an object, and might lead you in misjudgement of the range.

Type of target:
- Regular outlines = closer
- Contrast = closer
- Vague outline = farther
- Partly visible = farther

Nature of the terrain:

Object appears **closer** when looking
- **Ac**ross a hidden depression
- Down from high ground
- Large target - small surroundings
- Along a straight line
- Across flat, uniform surface

Object appears **farther** when looking
- Across a visible depression
- Up from low ground
- Down a narrow or confined space
- Small target, large surroundings
- If your eyes follow the contour

Light conditions:

Object appears **closer** when looking
- When target is under bright sunlight
- When the sun is behind you

Object appears **farther** when looking
- Low visibility conditions exist
- The sun is in front of you

Eye Estimation techniques
- The 100 Meter Unit of Measure
- The Appearance of Object Method
- Halving Method
- Bracketing Method
- Averaging / Combination

1. THE 100 METER UNIT OF MEASURE

Continuously make comparisons between the range you estimated and the actual size of a football field. Do this on varied terrain to get familiar with the various illusions that were discussed previously.

A thing to remember: The greatest limitation of the 100m unit of measure method is that its accuracy is directly related to how much of the terrain is visible. At ranges of 500m or more, usually only a portion of the ground is seen. This means that this method cannot be used with accuracy for distances of more than 500m.

2. THE APPEARANCE OF OBJECT METHOD

- 200 m Body parts are easily distinguished
- 300 m The outline of the face starts to become blurred
- 400 m The body outline can be distinguished, but not the face (except under very favorable conditions)
- 500 m The body starts getting thinner from the shoulders. Movements of the extremities are still visible
- 600 m Head is seen as a point, no details are distinguished, the whole body gets thin

3. HALVING METHOD

Use the halving method for distances beyond 500m. You pick a point halfway to the target, then use the - 100m unit of measure - to determine the distance to the halfway point. After that, just double the estimation.

4. BRACKETING METHOD

Use the average of the two distances as the estimated range.

$$D=(x+y)/2$$

5. AVERAGING / COMBINATION

-Sharpshooters can increase their accuracy of range estimation by eye, by using an average of both team member's estimation.

-We know that the -100m unit of measure- method requires a good view of the terrain between you and the target. We also know that the appearance of object method requires a good view of the target itself. There will be times when your view of the terrain and/or the target may be obscured. When this happens, you can use a combination of these methods.

ESTIMATION BY MEASURE

Map measure
Pace count
Sound measure

1. MAP MEASURE

1 mm on the map represents so many meters as the thousands of the denominator of the scale i.e.:

1 mm represents:
100m in a 1/ 100.000 map
50 m in a 1/ 50.000 map
20 m in a 1/ 20.000 map

The trace paper method is used to determine long distances. Place the paper on your map. Then make a tick mark on the paper at your position, and another one at the target location. Now place the paper on the map's scale, and line the left tick mark with the 0 on the scale. Then read to the second mark to find the distance between the two marks.

2. PACE COUNT

If your tactical situation permits it, you can actually pace the distance between two points. This may be while you are preparing a range card if you have arrived in your place prior to enemy presence. If there are equally spaced objects between you and your target, such as fence posts or telephone poles, you can pace the distance between one of them (or two for an average), and then multiply the distance you got by the number of intervals remaining to the target.

3. SOUND MEASURE

Sound velocity is approximately 330m/sec

1) As soon as you see the flash or the smoke of a weapon, you start counting in a rhythm of a number per second
2) As soon as you hear the sound, you stop counting.
3) The number that you have counted just before you heard the sound multiplied x 330, gives you the distance in meters.

ESTIMATION WITH OPTICS

Laser Range Finder
Rifle Optics

1. LASER RANGE FINDER

Can determine range to a very high degree of accuracy. When using the laser, support it to ensure accuracy. If the target is too small, aim the laser at a more distinct and larger object near the target. Rain fog or smoke, may limit the use of the LRF.

2. RIFLE OPTICS

Aim on your team mate on different distances during training, and log down how he looks like through your scope and crosshair, in various ranges, and at different positions also (standing, kneeling, laying). Doing so, you start with a very good asset, and remember that you will always be carrying with you your scope, but not always a LRF(costs!!!)

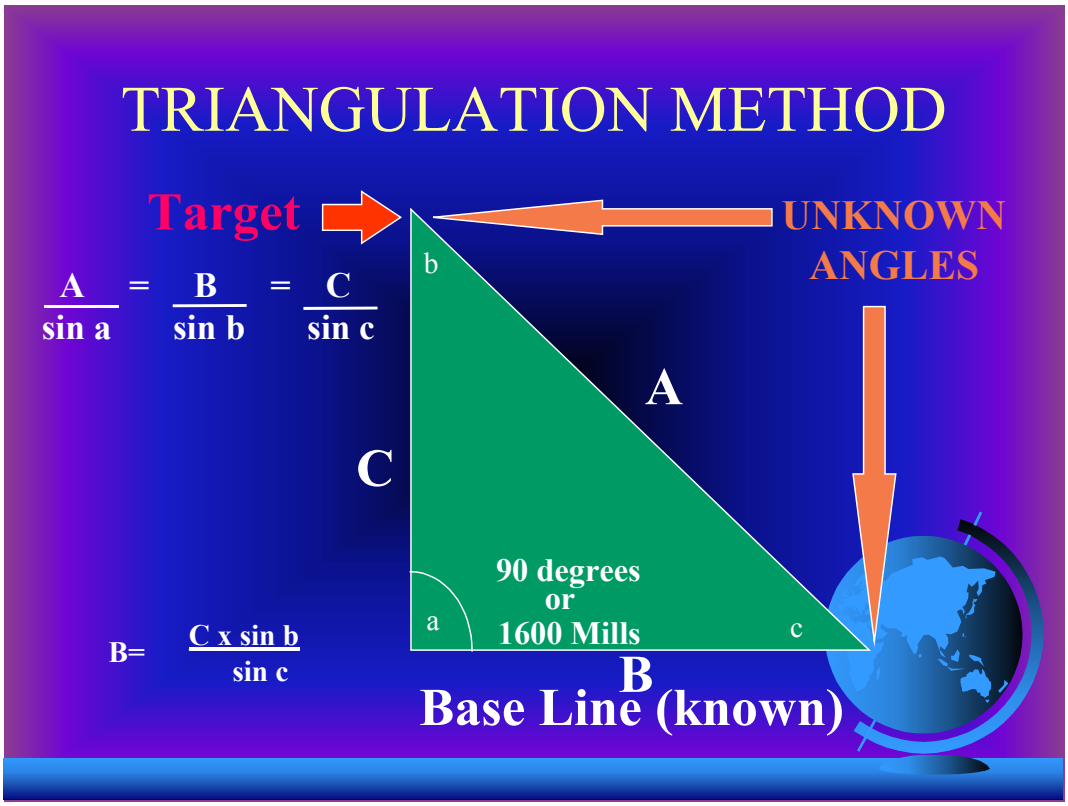
ESTIMATION BY FORMULATION

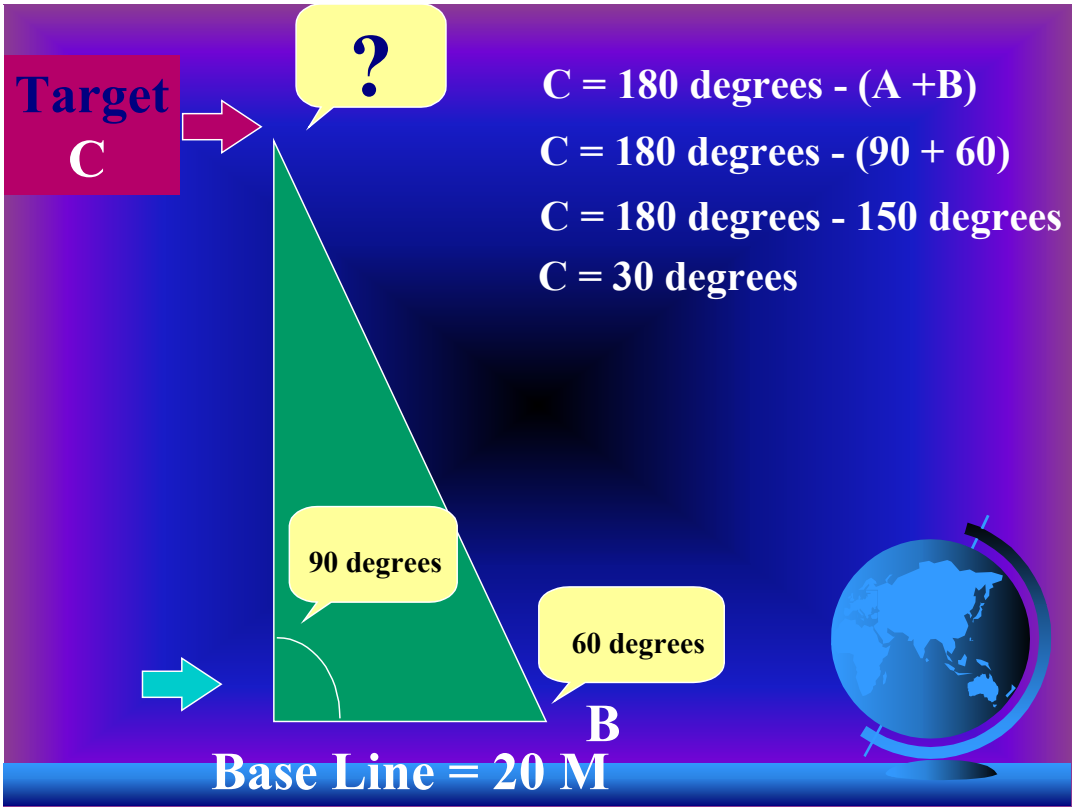
Triangulation
Mil relation

1. TRIANGULATION

Establish a baseline-Measure two Angles-Know your math

Triangulation Formula $\frac{A}{\sin a} = \frac{B}{\sin b} = \frac{C}{\sin c}$

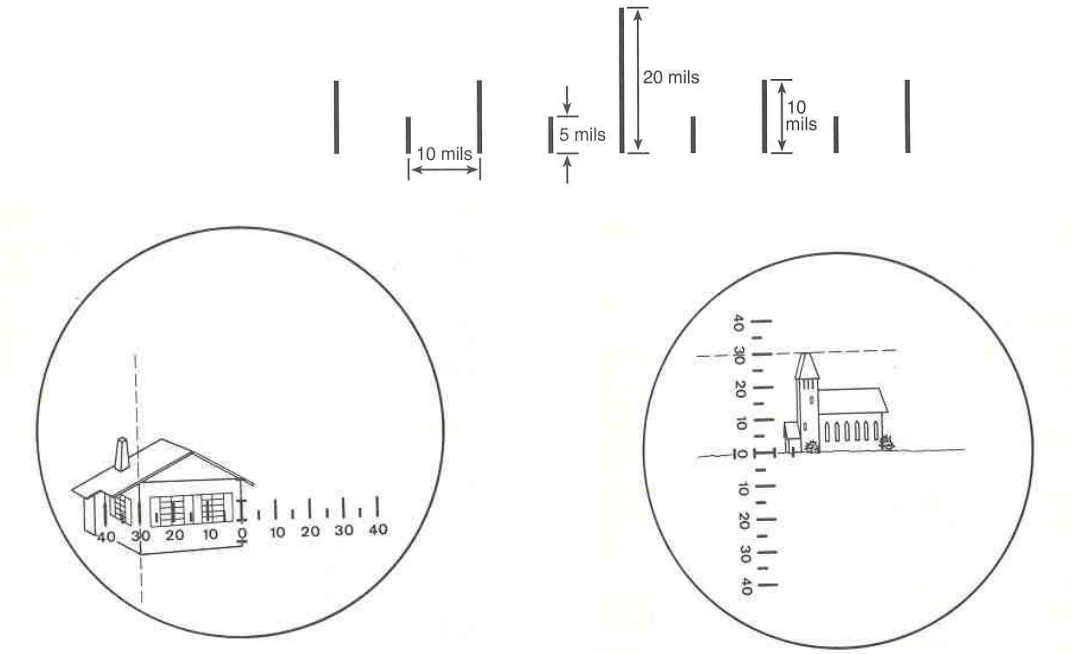

TRIANGULATION METHOD
Target
UNKNOWN ANGLES
A / sin a = B / sin b = C / sin c
b
A
C
90 degrees or 1600 Mills
a
c
B
B= C x sin b / sin c
Base Line (known)


Target C
?
C = 180 degrees - (A +B)
C = 180 degrees - (90 + 60)
C = 180 degrees - 150 degrees
C = 30 degrees
90 degrees
60 degrees
B
Base Line = 20 M

2. MIL RELATION

Know at least one of the target's dimensions-Have the capability to determine MILS of that dimension

GRATICULES

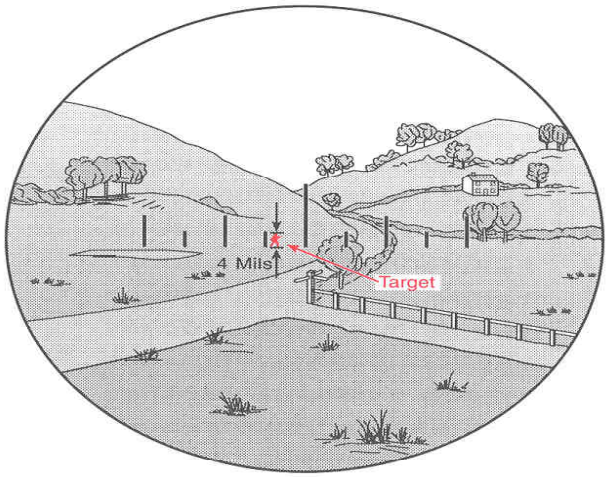


For Americans:

-If the known measurement is in inches
Divide it by 39 to get meters.
-If the known measurement is in feet
Multiply with 0.3 to get meters

Problem: As a Shooter you identify an enemy position. Using the MIL scale of your scope you determine the height to be 4 mils. **WHAT IS YOUR RANGE?**

Calculating using binos



AVERAGE MAN HEIGHT ~ 1,75 m
Range in Meters = 1.75 X1000/4
Range = 1750/4
Range = 437.5 Meters.

Do training again and again in order to be able to estimate correctly

Part 10

Panoramic sketching

Sketching & Logging

Every sniper have to be able to draw a clear sketch of an object or curtain terrain. This sketch can be used for recon and is a great value for an upcoming operation.
Some targets can be point out on the sketch and used for briefings. If there is a possibility of using photo and video equipment, the sniper pair should go for this option.

Definition:

A draw reproduction of a view as seen from a given point.

Equipment:

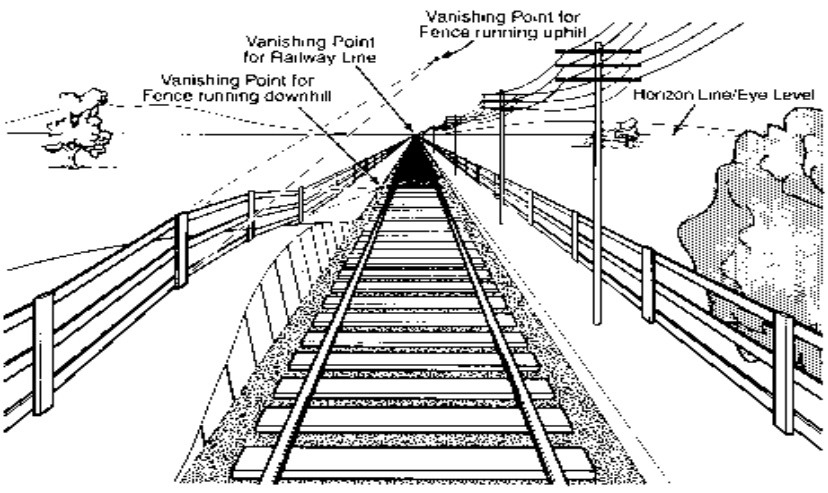
- Suitable drawing paper
- Pencils, sharpener &eraser
- Panoramic sketch viewer
- Protractor & ruler
- Clip board
- Observation equipment
- Maps

Principles:

- Study the ground with the naked eye and bino's.
- Determine the area of ground that the sketch will include.
- Select the major features that will form the framework of the sketch.
- Do not attempt to add too much detail.
- Minor features should be left out, unless they have tactical importance.
- Draw using techniques to give perspectives to the sketch..

Perspective:

- Similar objects should appear smaller the further away they are.
- Parallel lines, going away from the observer, will meet at a vanishing point.



Sketching:

The sketch should be clear and simple. Color can be used for emphasis, but used sparingly.
Draw all original lines lightly.
Use fewer rather then many lines to represent feathers.

Horizontal landscape lines first.
- lines should be firm and continuous.

Linear features: roads, rivers, power lines, buildings, etc..
- pencil lines should be darker as they approach the foreground.
- try to show roads, buildings, trees and all natural objects in outline only.
- peculiar shapes can be used for reference points.

Tactical importance features.

Intermediate detail
- shadings and hatching should be avoided for singular objects, only for large objects.
- when finished examine the sketch for accuracy and ensure nothing significant is missing.

Representation of features:

Trees
- use outline only, a particular tree for a reference point will need more detail.

Woods
- distant wood lines should be shown in outline only
- individual tops in foreground are okay to show.
- Wood can shaded

Rivers
- two lines narrow in width as they get further away.

Railway lines
- double lines with small cross lines.

Churches
- outline only, but denote towers.

Towns & villages
- definite rectangular shapes should be used for houses
- towers, smoke stacks and unique buildings should be indicated

Cuttings, moorland, hedges
- can be denoted with map signs.

Finishing:

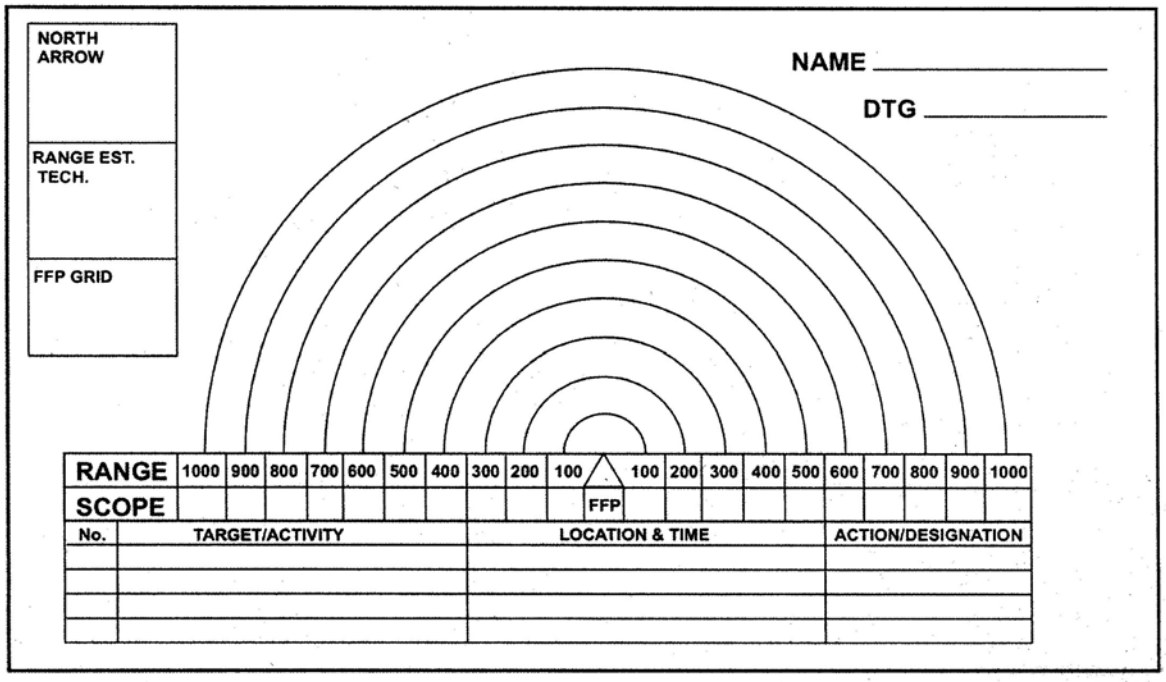
The following information must be given

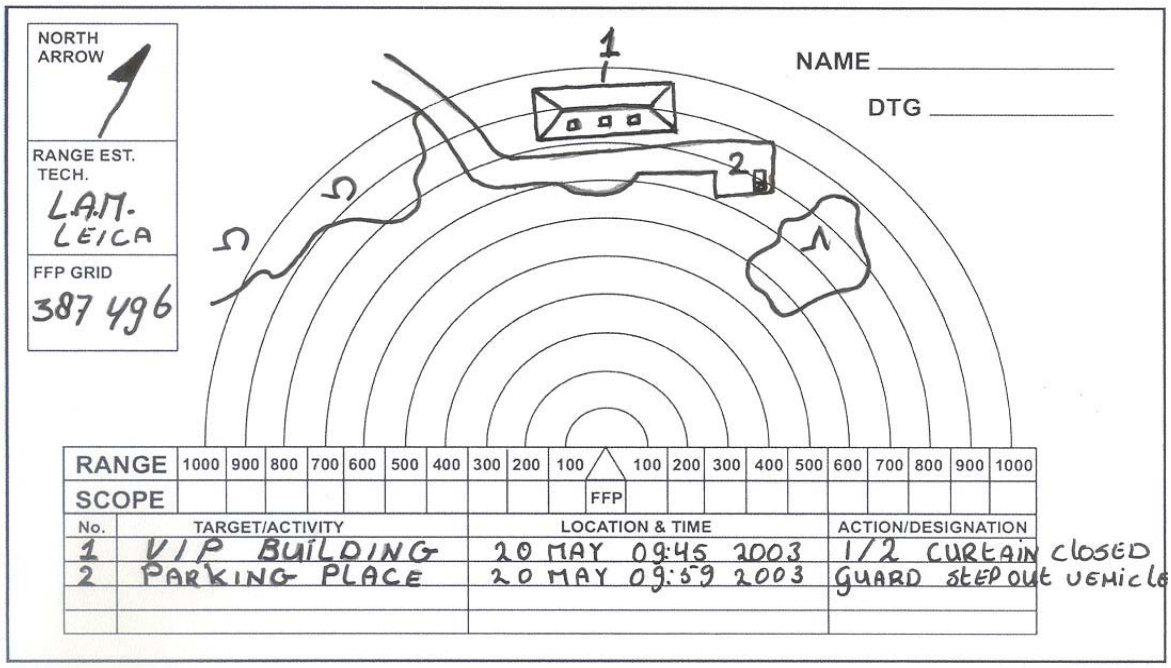
- Map reference of observers position (6 figure grid)
- The bearing of the left and right arcs given in mills or degrees from the observer's position
- North arrow
- Legend

Logging & reporting:

- Can be used in conjunction with the sketch.
- Works on a timely base.
- Intel and PIR's
- Formats
    - Simplicity
    - Clear and complete
    - Legible

Sniper range card:





Filling out Range Card:

After you ranged the landmarks you think targets may appear, you plot them on the range card. In our sample these include the edge of the wood, VIP building and the parking place. These become targets and are logged in and numbered.
The north arrow should be put into the upper left square. Under the north arrow you put the range estimation technique which you used. The grid you are on must be put underneath that.

Observation logs:

- Name.
- Date, tour of duty, time.
- Position.
- Visibility.
- Grid enemy.

Important information:

SALUTE

S = Size, number of soldiers
A = Activity, mobile, static
L = Location, distance, directions
U = Unit/ Uniform, as much detail as possible
T = Time, seen enemy, start/ stop time
E = Equipment, weapons, vehicles, color

For terrain we use a different abbreviation:

OCOKA

O = Observation
C = Cover & concealment
O = Obstacles
K = Key terrain
A = Avenues of approach

Part 11

Observation of the Ground

Observation of the Ground

A Sharpshooter / Sniper is able to observe, interpret and accurately report enemy movement.
Therefore he must be able to detect enemy presence before the enemy sees him. If he fails to so he will be not able to accomplish his task and in the worst case will be killed or the reason someone from his side get killed.

Target Indicators
A target indicator is ***anything that an enemy does or fails to do, that can enable an observer to detect the presence of the enemy, his installation or his equipment***.
The Sharpshooter / Sniper can betray themselves by providing target indicators to the enemy

THERE ARE FOUR BASIC TARGET INDICATORS

1.OLFACTORY
Smell (fires, soap, perfumes, insect repellents, cigarettes)

2.TACTILE
Touch (hides, trip wires or other wire (phone) used a lot during night)

3.AUDITORY
Hearing (moment, equipment rattle, machinery, talking)

4.VISUAL seeing (most relied upon sense)

Sometime combination from two Indicators (Seeing and hearing)

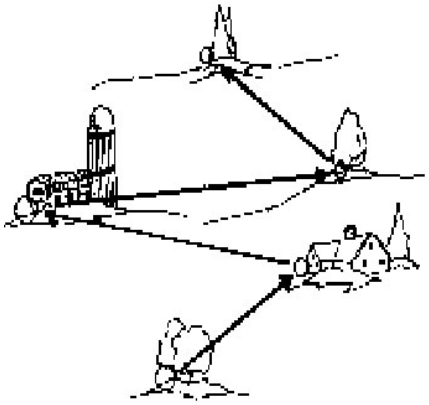
Based on this there are the following subgroups

- Shine /Surface
- Shape / Silhouette
- Movement
- Contrast
- Tactical sign
- Human sigh

Oberservation Methods

There are two methods of observation:
•Hasty and deliberate search
•Detailed Search

HASTY SCANNING



This is a very rapid check for enemy activity and is Conducted in about 30 seconds. Making swift glances at specific points in the area carries out the search.
You must start at the closest point to your position. Not by continues sweep. The eye cannot see detail or movement unless it comes to rest at a specific point.
When the eyes are focused on an object, they are sensitive to movement in a wide arc around that object.
This search will detect enemy activity in areas likely to be potential danger

DETAILED SCANNING

After the Sharpshooter / Sniper finished the hasty and deliberate and having not any enemy seen, he must then begin a systematic examination of his Arc of responsibility. As the Area nearest the Sharpshooter / Sniper offers the greatest potential danger, the search begins here. Beginning at either flank, the terrain should be searched in a 3200 mil arc, 50 meters in depth. After reaching the opposite flank the next area to be searched should be the terrain between 40 and 90 meters of the position. The second search includes about 10 meter of the area examined during the first search. This ensures complete coverage of the area. The search should continue as far the Sharpshooter / Sniper can see. Even while searching this manner, the eyes should still be focused on specific points.
In this movement will be seen more easily and the Sharpshooter / Sniper will become more familiar with the terrain he searches it.

MAINTAINING OBSERVATION

The Sharpshooter / Sniper must keep the area under Observation.
•Sequence hasty and deliberate searches at specific points
•Periodically a detailed search.

Observation Techniques

•Proficiency of the Observer to interpret what he sees. Proficiency as on Observer comes more from a mental attitude than from a physical endowment.
•As an observer, just like a hunter, you must learn to train your eye to notice little things, such as bending grass when there is no wind, the unnatural shape of a shadow, or the wisp of vapour in cold air. Even when the enemy cannot be seen, little things can give his location away, such as a window that is now open when it was closed before, a puff of smoke, signs of fresh soil, or disturbed undergrowth**.**
•Learn the habits of the animals in the area, or watch the domestic animals. A chicken suddenly darting from behind a building; sheep, goats, or cows suddenly moving or just becoming more alert in a field; wild birds flying or becoming quiet; insects becoming quiet at night; or animals startled from their positions should alert the observer of possible enemy activity in the area.
Study and memorise the area. In that way any change will alert your mind to the possibility of the enemy. Inspect all change closely to determine what caused the change.
As an observer you should keep certain rules in mind at all times while you are observing.
(1) **Learn to look for objects that seem out of place**. Almost every object in the wild is vertical; only man-made objects, such as a gun barrel are horizontal.
(2) **Learn to see things in the proper perspective at distances**. Learn to see movement, colour, shape, and contrast in miniature.
(3) **Learn to look through vegetation, not at it**. Do not be satisfied until you have seen as far as possible into the vegetation.

Consideration for Light

•Due to the constant changing of clouds and the position of the sun, light is a constantly changing factor in observation. Always be ready to watch the changing contrast and shadows. An area that you might have previously thought held no enemy might prove to be an enemy position when the light changes. When the sun is to your back, light will reflect from your enemy's optical devices. But be aware that when the light changes and is to your front, the enemy will be able to see the light reflected off your optical devices.
•When the sun is to your front, it is also more tiring for you to observe due to the light's being in your eyes. Be prepared to change personnel more frequently at this time if possible. If not possible, then use some type of shading to cut down on the amount of light coming into your eyes.
•Twilight is another time of light changes. The eye begins to produce visual purple, and the cone cells begin shutting down. Also, the iris opens more to let more light in. This causes the eye to constantly change focus, and consequently, this is more tiring to the eye. However, during twilight the enemy will usually become more careless, allowing an alert observer to spot that last change in position or that last cigarette before dark. Remember though, this is not a time for you to become relaxed.

Considerations for Limited Visiblity

It doesn't matter how bright the night is, there is a difference techniques during daylight and during the hours of limited visibility to see things and to train the eye.

A sharpshooter must learn to see things at extreme limit of vision. Watch for movement, an outline, and a patch of contrasting color beyond the first line of vegetation, looking though vegetation not at and look for miniature people and objects.

Darkness adaptation. It takes the eye about 30 minutes to regulate itself. Red goggles worn in lighted areas and/or red light will minimize the time needed for night adaptation.

Off - center vision is the technique of focusing attention on an object without looking directly at it.
An object under direct gaze in dim light will blur and appear to change shape and fade.

If the iris is focused at different points around the object, off center vision will provide a true picture of the object.
When scanning, it is important that the eye stops movement for a few seconds during the scan to be able to see an object. When scanning around an object, resist the temptation to look directly at the object "just to be sure" it is what you think it is.

THE FOLLOWING FACTORS AFFECT NIGHT VISION

1. **Lack of Vitamin A**, make sure your food have enough Vitamin A or take Pills to compensate the lack of it in you food.

2. **Colds, Headaches, Fatigue, Narcotic, Alcohol and heavy smoking** will as well greatly affect you ability of observation. For example smoking destroys Vitamin A.

3.**Exposure to bright light** will destroy you night vision for about 10-30 minutes, depending on the brightness and duration of the light.

How to train the eye for limited Visabilaty

•Darkness blots out detail, so you must train your eye to recognise objects by outline alone.
While some people can see better than others at night, everyone can use techniques to improve their vision at night.
•Train your eye to actually see all the detail possible at nighttime. When you see a tree, actually see the tree, not a faint outline that you think may be a tree.
•Open the iris. While the iris of the eye is basically automatic, you can train your eye to open the iris up even more to gather more light, thus allowing you to see in more detail.
•Practice roofing. Roofing is silhouetting objects against a light background.
•Manoeuvre to catch the light. At night noticeable light will only be in patches where it filters through the trees. You must manoeuvre to place an object between your eyes and that patch of light.

•Lower your body. By lowering your body or even lying down, you will be able to pick up more light and therefore see things that might otherwise go unnoticed.

Memory

It is essential that you are able to memorize things you see. Therefor train you ability to do so.
Kids do not memorize names, they memorize pictures.
Train yourself to do so as well and /or create a story around the things you see.

NOTE KEY FEATURES. MEMORIZE THEM AND THEN RECOGNIZE THEM.

Observation by Sourd

Many times, the sniper will hear the enemy before he sees the enemy. Also, the sounds or lack of sounds from birds, animals, or insects may alert the sniper to the presence of the enemy. A sniper must learn to hear all sounds, when sounds change, or when new ones occur. It is therefore important to train your ears along with your eyes
•The ear nearest the origin of the sound will pick up the sound first and will hear it slightly louder than the other. However if the sound reaches both ears at the same time and the same intensity you will not be able to determine the direction of it.
•If not this is what enables the sniper to determine the direction of the sound.
•Sound also loses its intensity with distance travelled. You must train your ears to become familiar with the different sounds at different distances so you can estimate the distance to the sound. This gives you a general location of the sound. You must learn to actually hear all sounds. Most people rely on sight for most information. A trained sniper must learn to use his ears as well as his eyes. As an observer, you should make a conscious effort to hear all the sounds around you so that when a sound changes or a new one occurs, you will be alerted to it.

•A sniper can also cup his hand behind his ear to increase his ability to hear and pinpoint the direction of the sound

The Crack and Thump Method
Through training the ear, you will be able to tell the approximate location of a shot being fired. Using the "crack-thump" method does this. When the sniper is fired at, he will hear two distinct sounds.
The bullet passing close to your position causes the crack. Do not look in the direction of the crack. This should alert you to start counting seconds.
The second sound heard is the thump of the weapon being fired. This is the location.
The time passed in seconds is the distance to the enemy.
Half a second is 300 meters, and a full second is 600 meters.
By listening for the thump and then looking in the direction of the thump, it is possible to see the flash or the smoke of the weapon being fired.
Remember that the crack-thump is a double-edged sword that may be used against you

Observation device use and slection

If you are in a team rotate the observation duties before your eyes get tired.
Make use of your available equipment.
Rifle Scopes
Will do for a the deliberate or the detailed scan method up to a level and depending on the Quality of the Scope.

NVD
Well, a very good asset if there is still light left (Stars, Moon Towns) and defiantly better than your eye. Think about that your eyes will get very quick tiered.

Binos
Normally they gathering more light specially during twilight hours and have the mil scale.
Therefore will be used for
•Observing target areas
•Observing enemy activity
•Identifying aircraft
•Improving low-light level viewing
•Estimating range
Calling for and adjusting indirect fires

Observation Scopes
With good Moonlight you will be able to see things up to 800 meter, however on high power you will decrease the field of view. As well you will have the tendency to look only far away.
Therefore you shut use the observation scope only for the detail inspection and not for observation an area
To summarise the use of a observation scope we can say.
•Reading environmental conditions
•Reading bullet trace and spotting
•Target analysis
•Target observation, detection, and identification
Discerning more detail at greater distances

Part 12

Individual movement /

Selecting lines of advance

INDIVIDUAL MOVEMENT & SELECTING LINES OF ADVANCE.

In many cases the success of a sniper's mission will depend upon his being able to close the range to his target and withdraw without being detected. To do this, he must be able to move silently through different types of terrain. As a sniper, part of your mission will be to analyze the terrain and the situation, select a good route to the target, use obstacles (man-made and natural) and terrain to their best advantage, and determine the best method of movement to arrive at your tentative final firing position. Once at the site, you must be able to select a final firing position. Upon arrival at your tentative final firing position, you must again use the same analytic procedures to select and occupy a final firing point. This will permit you, the sniper, the opportunity to complete your mission without compromise and leave the area without compromise. This requires the use of concealment techniques in conjunction with camouflage and route selection

Movement preparation for the mission requires planning both a primary and an alternate route to and from the objective.

(1) You can initially identify routes by studying maps, aerial photographs, and after-action reports or talking to people who have recently returned from the area.

(2) You can also construct sand tables of the area of operations to assist in forming and rehearsing the plan.

(3) After an actual ground reconnaissance, you may have to alter your plans.

a. Physical preparation for the mission is also necessary. Camouflage yourself and your equipment so that you will blend into the operational area.

When camouflaging weapons, ensure that the operation of the weapon is not interrupted.

b. You should take only mission-essential equipment into the operational area. Tape and pad all equipment taken to prevent noise.

In a field environment, given the requirement to employ the proper individual movement techniques to advance towards a designated target without being detected while wearing a ghillie suit and carrying the sniper weapon system (SWS).

You must be able to—

a. Move with stealth.

b. Enter the prone position from a walk.

c. Employ the four types of crawl.

d. Employ turns while crawling.

e. Move backwards while crawling.

f. Employ movement with the M24 SWS.

As a sniper, you must move with stealth, making frequent stops to listen and observe.

(1) While halted, replace and change your camouflage as necessary; identify your next position; then plan your move to it, taking maximum advantage of cover and concealment.

(2) Walking is the fastest and easiest way to move when extreme quiet is desired.

(a) When walking, make sure that your footing is solid. Keep your weight on one foot as you raise the other, being sure to clear all brush; then gently set the moving foot down, toes first, then the heel.

(b) Take short steps to maintain your balance. When carrying a weapon at night, hold the weapon close to your body, and use the other hand to feel for obstacles.

(3) When moving, use dead space and low ground and any weather or noise conditions (wind, rain, fog, shadow, etc.) to your advantage. When moving through tall grass, you should occasionally make a slight change of direction to keep the grass from waving in an unnatural motion. This will also keep you from leaving a very noticeable ghillie trail.

(4) If animals or birds are alarmed, stop, wait, and listen. Their flight may indicate someone's approach, or it could call attention to your position. When crossing roads or trails, look for a low spot or cross on the leading edge of a curve. Avoid cleared areas, steep slopes, and loose rocks. Do not skyline yourself. Do not move perpendicular to your target, as this will present a larger area that may be observed by the enemy.

(5) The most common mistakes made while moving are losing sight of your target, standing upright to see over the terrain, and failing to update your camouflage so that you blend into the background.

(6) Before you move into your final firing position, ensure that you have taken advantage of natural cover and concealment, you will not contrast with the background, you have not picked an obvious location, and you have not misused the shadows. Clear the vegetation so that it will not interfere with the flight of the bullet, and ensure that you are able to observe the target after the shot is taken.

To assume the prone position from a walk, stop, tuck your rifle under your arm, and crouch slowly. Simultaneously, feel the ground with your free hand for a clear spot. Then lower your knees, one at a time, to the ground. Shift your weight to one knee, and lift and extend your free leg to the rear. As you lower your free leg, use your toes to feel for a clear spot. Roll onto that side; then lower the rest of your body into position.

a. Crawling is a method you can use to move into and out of your observation/firing position.

b. Use the sniper low crawl when in low cover. To assume the low crawl position—

(1) Assume the prone position, placing your body as flat as possible to the ground. Ensure that both legs and heels are together and the feet are flattened to the ground.

(2) Grasp the upper portion of the rifle sling, and lay the stock across the back of your hand or wrist with the rifle between your body and the ground.

(3) Extend your arms straight out in front of you flat on the ground.

(4) To move forward, slide your arms to the front and dig in with your toes; then pull yourself forward with your arms while pushing with your toes.

(5) Keep your head and heels low to the ground.

c. The medium crawl is similar to the sniper low crawl in that it is used in low cover. However, this crawl is faster and less tiring than the low crawl. To assume the medium crawl position—

(1) Keep all parts of the body as low as possible to the ground.

(2) To move, cock one leg to push yourself with, and pull with the arms.

(3) When one leg becomes tired, use the other leg. However, you should use only one leg at a time in order to keep your buttocks low to the ground.

d. The high crawl is used when cover is more prevalent and speed is required. To assume the high crawl position—

(1) Rest your body weight on your forearms and the lower portion of the leg (shin). Ensure that your body is off the ground.

(2) Carry your weapon by cradling it in the crook of your arms or by grasping the sling swivel as in the low crawl.

(3) To move, use your right arm and left leg, then your left arm and right leg. An alternate method is to pull with both arms and push with one leg. Keep your legs well behind the buttocks and your head down to maintain a low silhouette.

e. The hands and knees crawl is a good technique to use in periods of limited visibility and/or when concealment is good and speed is needed. To crawl on your hands and knees—

(1) Hold your rifle in your left or right hand in line with your body, or place it on the ground along your left or right side.

(2) Shift your body weight to the left side, and move your right hand into a predetermined position.

(3) Move your right knee to a position near your right hand, shift your body weight to your right side, and move your left hand and knee into position.

(4) If absolute silence is necessary, move small twigs and leaves out of the way before placing your hands and knees.

Turning while crawling requires some variations.

(1) To make a right turn, ease your body as far as possible to the right. At the same time, bring your legs together.

(2) Move your left leg as far as possible to the left. Then move your right leg to the left leg.

(3) Repeat this procedure until you are facing the desired direction. Adjust your upper body position as necessary.

Movement with a weapon during periods of limited visibility is essentially the same as day movement.

(1) At night give special attention to slower and more deliberate movement and to the senses of touch and hearing.

(2) It is to your advantage to move under the cover of darkness and in periods of adverse weather conditions.

Part 13

Sniper hides and loopholes

Sniper Hides

By way of introduction, the skills snipers employ by way of concealment, observation, intelligence gathering and information reporting. And his ability to infiltrate to his area of observation by way of meticulous and discipline patrolling. Culminates in his ability to man, sustain and report within the OP undetected and alone if necessary.

A disciplined OP, well sighted and manned by confident, competent and well trained observer is, without doubt, the very best eyes and ears a Commander from Company level could ever hope to have at his personal and immediate disposal. And it is into this most vital of roles in which the sniper will be expected to fulfill, with all the exacting standards of professionalism in all aspects that the title of sniper commands.

However sadly to few commanders ever utilize to the full potential, this seldom used, all important and readily available resource. Most do not use them at all. The reality is more likely than not, this lack of use occurs through sheer ignorance in how to use them. And use them well.

Definition:

A position from which the sniper can observe, report and engage the enemy, while remaining concealed from the enemy observation. Potentially covered from fire and may further more withdraw undetected.

Possible tasks:

- Sniper task
- Cover gaps
- Act as early warning
- Intelligence gathering and information reporting
- Artillery and mortar fire control
- Forward Air control

Selection:

After receiving a mission, the sniper team identifies the target area and then select a tentative primary and an alternative hide position. The team uses available information: maps (military and tourist), aerial photography, visual reconnaissance (I.e. over flight) and friendly patrols that have been in the area.

The team is looking for a position that provides a balance between the following considerations:

1. Maximum field of fire and observation.
2. Maximum concealment and cover from the enemy observation and fire.
3. Covered routes into and out of the position.
4. A natural or man-made obstacle (if possible) between the position and the target area (I.e. mines, roads, rivers)
5. Communications

The team should select a position that is at leased likely to be occupied by the enemy. A position that seems ideal could also appear that way to the enemy.

Locations for a sniper hide:

Use imagination and resourcefulness when choosing a hide. Chose an effective location that would appear to be the least likely place to the enemy.

- Under logs or deadfall
- Tunnels bored from one side of a knoll to another
- Deeply shadowed areas
- Rubble piles

Locations to be avoided:

- On the point of crest of prominent terrain features
- Close to isolated objects
- Against contrasting background (sky lining)
- At bends in or the end of trails, roads or streams
- Near populated areas, unless required

Once the hide area has been selected, some further considerations will be necessary.

Planning considerations:

While planning a mission involving a hide, the sniper team needs to plan in depth and plan contingencies.
Some considerations are:

1. Type of terrain and soil
2. Enemy location and capabilities (I.e. observation devices, roving patrols
3. The mission and time
    Length of time position is to be occupied
    Time needed for construction
4. Equipment needed for construction
5. Personnel needed for construction
6. Routes in and out
7. Cache: will extra equipment and supplies be needed to be stashed
8. No communications procedures
9. Compromise procedures

Equipment:

- Digging tools
- OP construction kit
- Optics day/ night
- Radios (lithium batt., codes)
- Dictaphone and tapes
- Photography equipment
- Log books
- Extra batt.
- Piss bottles/ shite bags
- Trauma pack

Once enough information has been gathered, the type of hide will be decided.
We'll discuss six types of hides today:

Un prepared sniper hide:
Hasty hide

Prepared sniper hide:
Expedient hide
Belly hide
Semi permanent hide
Improvised hides
Dummy hides

Hasty hide

Advantages:

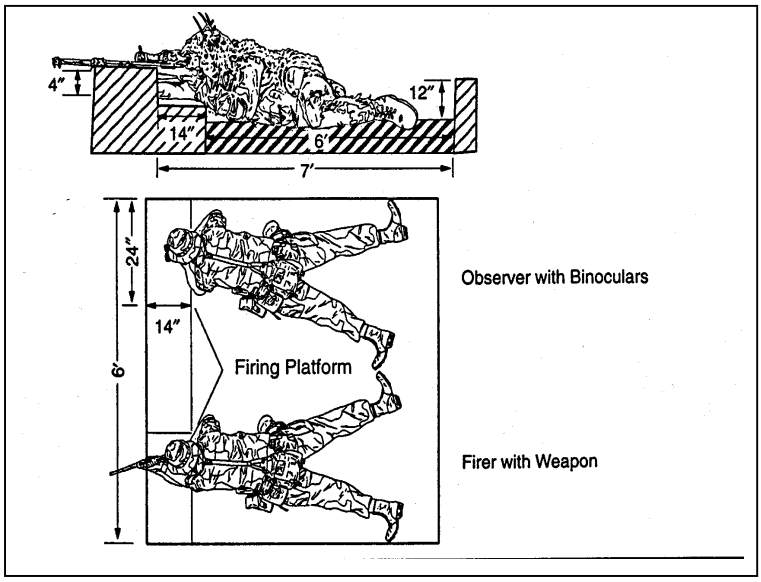
- Easy and quick occupy
- Easy to change positions (guerrilla warfare)

Disadvantages:

- No comfort
- Occupation time 12 hr
- No protections from enemy fire
- Relies heavily on personal camouflage

Expedient hide:

Places team and equipment below ground level, can be dug under rocks and logs.
No overhead cover.



Advantages:

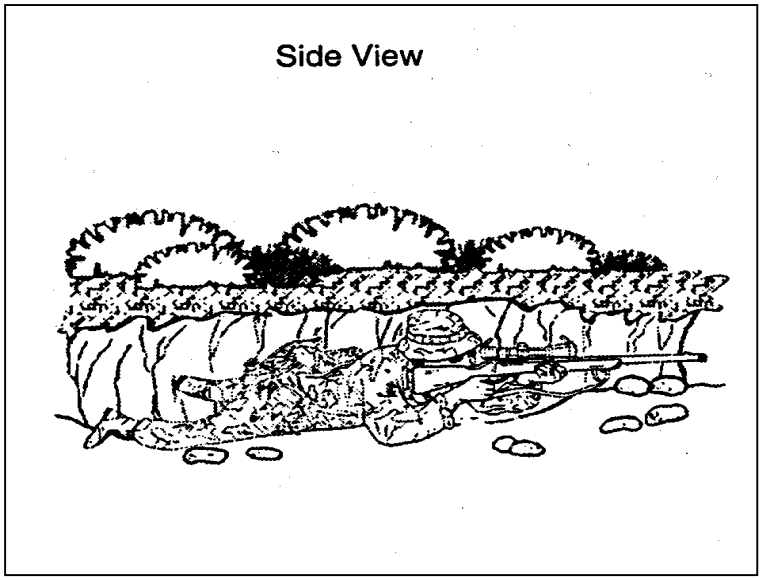
- Requires little construction
- Conceals most of the body and equipment
- Provides some protection from enemy fire
- Allows more freedom of movement

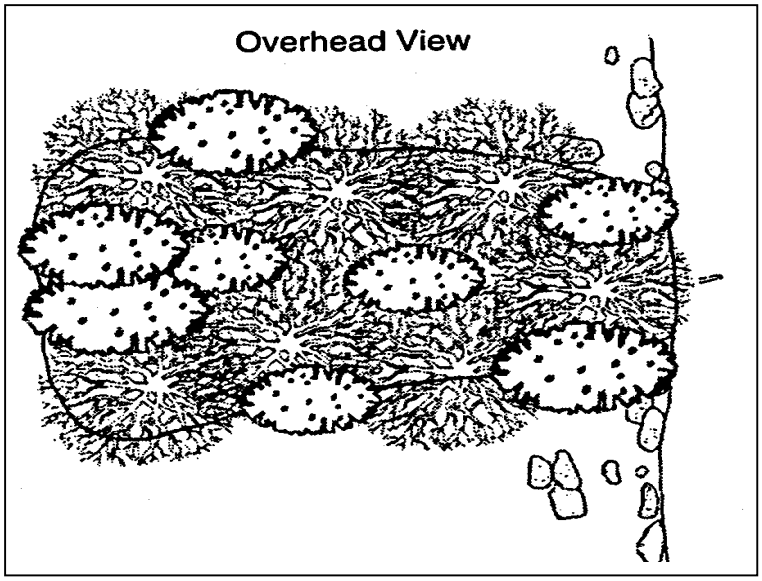
Disadvantages:

- No comfort
- Occupation time 12 hr
- Little protection from enemy fire
- Relies heavily on personal camouflage

Belly hide:

Places the team and equipment below the ground level. Can be dug under rocks and logs to aid with overhead cover.





Advantages:

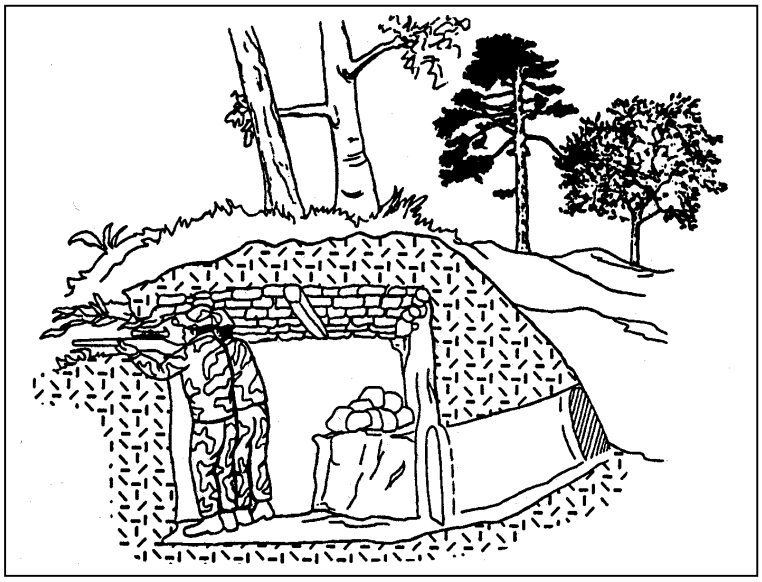
- Allows more freedom of movement
- Conceals all equipment but the rifle barrel
- Provides more protection against small arms and indirect fires

Disadvantages:

- Requires extra construction time (3-5 hr)
- Requires more materials
- Limited space
- Occupation time 12-48 hr

Semi-permanent hide:

Used mainly in defensive situation and allows the team to be in place for extended periods.



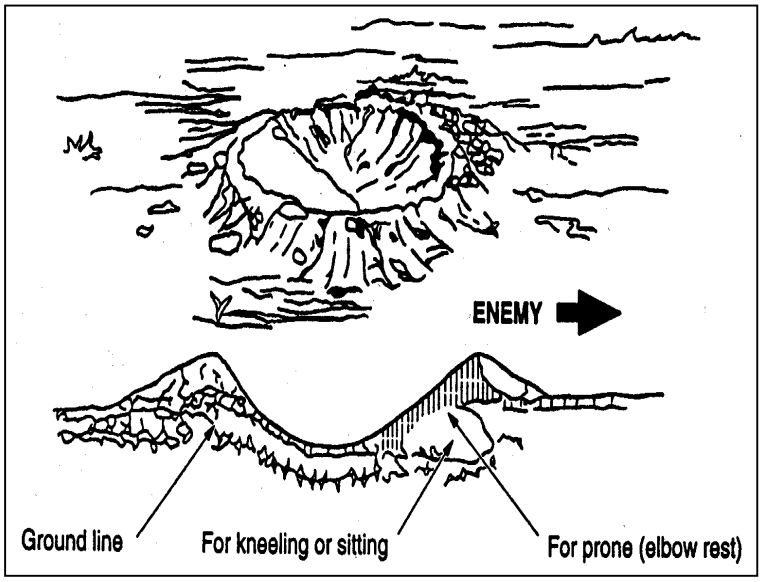
Advantages:

- Offers total freedom of movement and allows the team to be in place for extended periods of time
- Protects against direct and indirect fires
- Is completely concealed, loop holes are 10-14 inches inside and 4-8 inches outside
- Easily maintained for extended periods

Disadvantages:

- Requires extra construction time (4-6 hr)
- Requires extra personnel and tools to construct
- Increased risk of detection
- Occupation time 48 hr plus (relieved by other teams)

Improvised hides:



- Shell holes
- Trees
- Bushes
- Buildings
- Cars

Dummy hides:

Enemy might have an idea where the shot originated.
Instant enemy counter fire on obvious hides

Divert fire:
- Not too close
- Not too obvious
- By a construction or movement

Construction of hides:

- Pit
- Overhead
- Entrance
- Loop holes
- Approaches

Occupation:

The team must plan for an ORP(objective really point) to prepare for locating the exact location of the hide. The ORP should provide cover and concealment from enemy observation and fire. It should be located as close that noise of preparation can be heard.

The ORP should also provide good routes in and out of the tentative hide area.
From the ORP the team moves to a location that provides a view of the tentative hide area. One man stays at this location an covers the other man as he moves forward to locate the final position. Once the position has been identified, the covering member moves to his partner's location.

While moving, the team member should:

1.Move slowly and deliberately, using necessary techniques
2.Avoid obvious of vegetation an unnecessary noise
3.Stay in available shadow and avoid viewing over skyline
4.Stop, look and listen every few feet

Once the team is in position they

1.Conduct a detailed search of the target area
2.Begin construction
3.Establish a system of observing (sentry)

Firing from the hide:

A target may present itself that your rules of engagement and orders allow you to destroy.

To prevent detection by enemy, consider:

1.Strict fire discipline
2.Muzzle flash (suppressor)
3.Smoke: keep the bore of the weapon dry, keep a cleaning rod and patches handy.(suppressor)
4.Blast: should not disturb vegetation. Clear area near muzzle to prevent dust (wet towel)
5.Wind: pay close attention to the effects of wind outside the hide

Actions on:

- If it is the OP witch is compromised, get on the 'BAT PHONE' to the LUP or vice versa.
- Dependent on the type of comms you have back to control, transmit 'CONTACT WAIT OUT'.

- React accordingly to the threat. Get your Grab Bags one of which must have the radio, med pack and sensitive material. Get your belt kit and weapons and crash out the ERV.
- Head count then move off rapid. Once you've put distance between you and any pursuing force, establish comms back to base and get that contact report off and keep sending until you get an acknowledgement.

Confirm the grid of the pre-designated RV target may present itself that your rules of engagement and orders allow you to destroy. for extraction as given in your orders. Calculate the time to the pick up grid, and give control a time frame to work from i.e. 'if nothing heard pick up in 2 hours' and wait for confirmation

Move off again through the same RV chain that you unfilled through. The same RV chain that the Ops room back at control have a copy of.

Move to the pre- designated RV. Secure it, inform control and wait out.

Part 14

Tracking / Counter tracking

INTRODUCTION TO TRACKING/COUNTERTRACKING

Visual tracking is the art of being able to follow a person or an animal by the signs they leave during their movement. It is next to impossible to move cross-country and not leave signs that you have passed through an area, however small, and a trained and experienced tracker can detect those signs. However, a person who is trained in tracking techniques can use deception drills that can minimize telltale signs and throw off or confuse trackers who are not well trained or who do not have the experience to spot the signs of a deception. Remember, regardless of how well you can shoot, if you cannot get to your final firing position due to compromise, you will not complete your mission.

The three techniques used by dogs to track are——

(1) Visual——Dog sees the sniper, follows him, and attacks him.

(2) Search——Dog builds the scent picture of the sniper and follows him using the sniper's airborne scent.

(3) Tracker——Dog follows the ground scent left by the sniper when he passed over the ground.

b. The four classifications of tracker dogs used by the different armies of the world are——

(1) Tracking.

(2) Scent discrimination.

(3) Search and rescue (SAR).

(4) Area search.

c. The tracking and trail dogs work on a 10- to-30-foot harness, depending on what country they are trained in. The SAR dogs will work either on a line and harness or will do free search looking for any fresh human scent in a given area. The area search dog is used when a person or persons are isolated in a small area. The dog is brought into the wind, turned loose, and uses scent until he sees the persons and then goes into the attack mode.

Dogs may have poor eyesight; however, they make up for it with an excellent sense of hearing and a fantastic sense of smell. A dog's sense of hearing is about twice that of a human's. Be sure to tape all of your equipment. Be aware of any noise that you may make. Stay alert of the wind direction. Take advantage of bad weather, i.e., rain, sleet, etc. Remember that a dog can smell food cooking as far as two miles away.

. A dog builds a scent picture of the person he is tracking. Airborne scent is your scent that you carry with you into the operational area. Your airborne scent can be made up of almost anything that you bring into the area that is not indigenous to that area.

b. Ground scent is made up not only of your scent, but also that scent from the ground that you have disturbed during your movement. Your scent will be left on the ground and surrounding foliage. In addition, the decaying scent from the dead foliage under the surface where you have stepped will leave a trail that the dog will follow.

c. Scent is normally short-lived, and its life span is dependent upon the weather and the area the person last passed through. The sun and the wind, as well as time, destroy the scent. Remember that you must be concerned with both airborne and ground scents. Airborne scents can be blown away within minutes or a few hours. Ground scents can last as long as five days under ideal conditions.

d. When dogs are being used against you, they use the odors left behind, or around you, to track you. Sweat from exertion or fear is one of these. Wet clothing or material from damp environments holds your scent. Soap or deodorant used prior to infiltration helps the dogs find you. Foreign odors, such as oils, preservatives, polish, and petroleum products, also aid the dogs in finding you. Using tobacco products, such as smoking or chewing, also leaves a definite scent for the dogs to follow. Dogs can smell moist foods and fires when you stop to eat. Be sure to change your diet to that of the local inhabitants prior to infiltration. While there is controversy on whether this would help, it can't hurt. While a dog does not track on the race of a person, it may aid in confusing cross tracks.

a. When you first arrive in your area of operations, it is best to move initially in a direction that is from 90 to 170 degrees away from your objective. Remember that a tracker team will call in a blocking force and, if you move directly in line with the objective, they will alert the objective to the possibility of an attack.

b. When the situation permits, make your changes in direction at the open points of terrain that may be windswept and or have strong sunlight that shines on the terrain. This

will aid in blowing away the scent or the sun's destroying the scent. This could force the dog to cast for your scent.

c. If dogs are very close behind you, moving through water does not confuse them, because your scent will hang in the air above the water. Moving through water will only slow you down. Also, throwing tear gas to your rear or using blood and spice mixtures or any other concoctions you think will prevent a dog from smelling your scent will not be effective on a trained tracker dog. At the first sign of the substance, he will avoid the area or in many instances, these attempts will cause the dog to sneeze violently and thus clear his sinuses so that he can smell better.

d. While a dog will not be confused by water if he is close to you, running water, such as a rapidly moving stream, will confuse a dog if he is several hours behind you. However, remember that areas with foliage, stagnant air, and little sunlight will hold your scent longer. Therefore, you should avoid swampy areas, because your scent will remain in the area for a longer period of time and will assist the dog in finding you. However a technique that could work is to move alongside a swamp and cause the scent to be blown into the swamp. This will cause the dog to track into the swamp and tangle his tracking line. This is very tiring for the dog and the handler.

e. Try to move through an area that has been frequently traveled by other people, because this can confuse your scent picture to the dog, if the dog is the tracking dog variety. Check with your S2/G2 to find the type of dogs you will be up against.

f. Team members should split up from time to time to possibly confuse the dogs and change off the tail gunner. The best place for this is in areas frequently traveled by indigenous personnel because this will add to the cross contamination.

g. Another technique that can be used is to reverse the principle of leaving the smallest amount of scent to leaving a "scent pool." A scent pool is where you will leave a large obvious point of scent to cause the dog to begin an alert, thinking that you are in the area. The dog handler will then have to proceed on the basis that you are in the area. Once he has finished clearing the area, the handler must place the dog back on track. The dog thinks he has won the game, but the handler is making him "play the game" again. The false alert and the dog thinking he is done will plant the seeds of doubt in both the handler and the dog. Scent pools can be left at different sites. However, they are best used at changes in direction or backtracking on your trail to help confuse the tracking party.

h. If a dog tracker team is on your trail, do not run. Running causes your scent to become stronger. You may attempt to wear out the dog handler and confuse the dog, but always be on the lookout for a good ambush site that you can fishhook into. If it

becomes necessary to ambush the tracking party, fishhook into the ambush site and kill or wound the handler, NOT the dog. Tracker dogs are trained with their handler, and a trained tracker dog will protect his wounded handler. This has the potential of allowing you to move off and away from the area while the rest of the tracking party tries to give assistance to the handler. Also, that dog will not work well with anyone other than his handler. Prior to infiltration, check with the S2 and find out if the dogs in the area are trained to attack on gunfire. If they are, be sure your ambush is triggered with suppressed weapons or the distance is such that you can fire on the dog as well.

Identify visual tracking signs.

As a sniper in a field environment. you must:

a. Define visual tracking signs.

b. Identify the classifications/categories of visual tracking signs.

Signs are visible marks left by the movement of an individual or an animal while passing through an area. These signs are broken down into classifications, with each classification having smaller classifications that overlap into each other.
The first major classification consists of signs left below the knees. These are classified as ground signs. All ground signs are further divided into large and small ground signs.

(1) Large ground signs are caused by the movement of 10 or more individuals through the area.

(2) Small ground signs are caused by the movement of one to nine individuals through the area.

b. Signs left above the knees are called top or high signs. These signs are also divided into large and small top signs.

c. All signs are divided into either permanent signs or temporary signs.

(1) Temporary signs are those signs that will eventually fade with time. (A footprint is a temporary sign.)

(2) Permanent signs are those signs that require weeks to fade or that will leave a mark forever (e.g., broken branches or chipped bark).

d. All of the above signs are further divided into more categories. These categories contain specific examples of a sign and indicate the passage of an individual. Many signs overlap into more than one or two categories.

e. The first category is the footprint itself. This category may consist of the whole footprint or of a heel dig or a toe push only. The footprint is, of course, the most obvious of signs indicating the size and weight of the individual, how much weight he is carrying, how fast he is moving, and in many instances the sex of the individual. With multiple footprints you can determine the size of the group. With clear prints you can determine the state of alertness the individual is traveling under, his state of training, his morale, and how tired he was at the time the prints were made.

f. If a clear print is available, make a drawing of the print and measure the foot length and width at the widest point and at the heel. If a second print is available of the next step, measure the stride for reference later in tracking.

g. The next category is displacement, which consists of anything that is moved from its original position.

(1) The first obvious example of displacement is the footprint itself. However, other examples include leaves moved from their natural position, grass moved, small rocks rolled over, broken dirt seals around rocks, mud or dirt moved to rocks or other natural debris, and water moved onto the banks of a stream.

(2) Taking all the above into consideration, it becomes obvious why a brushed-out trail looks like a brushed-out trail and aids, not hinders, tracking.

h. Another category is discoloration or staining. This category of signs is usually a by-product of displacement.

(1) On a calm, clear day, leaves of bushes and small trees are generally turned so that the dark top side shows. However, when a man passes through an area and disturbs the leaves, he will generally cause the lighter side of the leaf to show. This is

also true with some varieties of grass. This causes an unnatural discoloration of the area, which is called "shine."

(2) Grass or leaves that have been stepped on will have a bruise on the lighter side.

(3) Mud or dirt that has been displaced onto rocks, tree roots, or debris will cause a stain.

(4) Any body fluids, such as blood, urine, or feces, deposited on the ground, trees, bushes, or rocks will leave a stain.

(5) Silt or mud stirred up during your movement through a stream will leave a stain in the water for a period of time, and the stain will move downstream with the current; therefore, it is usually best to move downstream.

i. Littering is the next sign. Litter consists of anything that you leave on the ground.

(1) Most people think of discarded cigarettes and gum wrappers as litter. However, don't forget urine, feces, blood, bloody bandages, or anything else that could be left behind that is not indigenous to the area.

(2) You should also know the wildlife in the area, because even sumps, regardless of how well camouflaged they are, are a potential source of litter. This is due to the fact that many animals can find the sump and dig it up for food. The best policy you can follow is to take out with you everything you brought in.

j. Weathering plays an important part of tracking in that it aids the tracker in determining the age of the different signs.

(1) Eventually, with time and weathering, all signs that are not permanent will disappear. Wind, rain, snow, sun, and Mother Nature all combine to slowly change the appearance of signs. It is up to the tracker to determine the age of signs by this weathering.

(2) By knowing when a rainstorm passed through the area, you can determine the time frame in which a footprint was made. Additionally, in an area where earthworms are present, the time frame can be narrowed even further.

(3) Knowing that winds were in the area will also aid in determining the sign's age.

ANTITRACKING AND DECEPTION TECHNIQUES

Deceptive tactics and techniques that can be used to lose or confuse visual trackers.

As a sniper in a field environment. you must be aware of the methods used to confuse or deceive human trackers.

There are two types of human trackers: combat trackers and professional trackers. Professional trackers go from sign to sign. If they cannot find any sign, they will stop and search until they find one. Combat trackers look ahead for signs and do not look for each individual sign to track you.

a. The only way to lose a trained professional tracker is to fishhook into an area and then ambush him.

b. Luckily there are few professional trackers employed in the world's armies today, and there are several techniques that can be used to confuse the combat tracker and throw him off the track.

c. A tracker team's job is first to find your sign passing through the area and follow it. Then they will determine whether it is friendly or enemy. After they estimate the size, direction, and speed of the tracked party, they will call for a blocking or ambush force. Tracker teams do not want to become engaged.

d. As with the dogs, to confuse the combat tracker and throw him off the track, always start your movement away from your objective. Travel in a straight line for about an hour and then change directions. This will cause the tracker to cast in different directions to find your track.

e. The big tree method is a good technique to use to deceive a tracker. When moving toward an open area, move past a big tree in such a manner that it is just to one side of you. This must be the side that you wish to change directions to on your next leg of travel. Walk past the tree into a clear area for 75 to 100 meters and then walk backward to the tree. At this time move 90 degrees and pass on the side away from the tracker. This could possibly cause the tracker to follow your sign into the open area where, when he loses the track, he might possibly cast in the wrong direction for your track.

f. Another technique is the trail technique. This technique requires the presence of a trail that is marked on a map and your knowledge of the correct location and direction of the trail. At approximately 100 meters from the trail, start a slow drift in the same

direction as the trail. This will cause you to hit the trail at an angle. When you hit the trail, move along it in the same direction as the angle that you entered it. Stay with the trail for about 20 to 30 meters and then move backward to a point where you can move off the trail on the other side without making a sign. Move at a 45-degree angle away from your original track for several hundred meters and then change back onto your track, using the big tree method if possible.

g. A stream can be used in the same manner as a trail. However, with this method you have the added advantage of using small tributaries when exiting the main stream to further confuse the tracker as to your exit point. False exit points can also be used to further confuse. However, you must be careful not to cause a false exit to give away your intended travel direction.

REVIEW/SUMMARIZE

a. The objective of this class of instruction was to enable you, given an overview of the techniques used to track a human and to evade dog/visual tracker teams and a field environment, to employ the techniques used to evade dog/visual tracker teams.

b. Dog and visual trackers are not infallible, and they can be confused with simple techniques and clear thinking. Don't panic and try to outrun a dog or visual tracker. This only makes it easier for the tracking party. Keep your head and plan ahead. Even if you know that trackers are not in the area, it is best to use countertracking techniques. This will save you possible grief in the long run.

c. Following are some important points you should remember.

(1) The three techniques used by tracker dogs are——

(a) Visual.

(b) Search.

(c) Tracker.

(2) Always try to break the trust between the dog and the dog handler and confuse them as to what they are trying to tell each other.

(3) Use weather and terrain to your advantage and remember how your scent weathers.

(4) Do not panic and run. This leaves a larger scent picture for the dogs and greater visual signs for a human tracker.

(5) If you must fishhook and shoot, always shoot the handler, not the dog. This will cause confusion, and the dog will attempt to protect the handler from those trying to give the handler aid.

(6) Use countertracking techniques as a regular technique of movement so that any tracking parties that cut your trail will have greater difficulty in maintaining your track.

Part 15

Sniper / Observer

Dialog

SHOOTER/SNIPER – SPOTTER/OBSERVER RELATIONSHIP

Each member of a sniper team has specific responsibilities. Only through repeated practice can the team begin to function properly. We will take a look at both the sniper team and the sniper team as a part of a platoon/Task Group.
Responsibilities of team members are as follows:

The shooter/sniper :

a) Builds a steady, comfortable position
b) Locates and identifies the designated target
c) Estimates the range to the target
d) Dials in the proper elevation and windage to engage the target
e) Notifies the spotter/observer of readiness to fire
f) Takes aim at the designated target
g) Makes an accurate and timely shot
h) Prepares to fire subsequent shots, if necessary

The spotter/observer:

a) Properly positions himself
b) Provide security for shooter/sniper
c) Assist with equipment and communications
d) Selects an appropriate target
e) Assists in range estimation
f) Calculates the effects of weather conditions on ballistics, windage
g) Reports sight adjustment data / location of bullet impact to the shooter/sniper
h) Uses his spotter scope for observation
i) Critiques performance
j) Relieve sniper on prolonged operations
k) Maintain operational/sniper log

A sniper team must be able to move and survive in a combat environment. The sniper team's mission is to deliver precision fire. This calls for a co-ordinated team effort. Together, the shooter/sniper and spotter/observer:

Team firing techniques:

a) Determine the effects of weather on ballistics
b) Calculate the range to the target
c) Make necessary sight changes
d) Observe bullet impact
e) Critiques performance before any subsequent shots

COMMUNICATION IN THE SNIPER/SHARPSHOOTER TEAM

It is necessary that both spotter/observer and sniper/sharpshooter know exactly what the other is doing and what he is saying when locating the target. Any method that is understandable to both and is fast to use is acceptable. They must use short and concise words to locate the target. Each must always be aware of what the other is doing so that the sharpshooter/sniper does not shoot before the spotter/observer is ready. The form of dialogue will also depend on whether or not the team is in direct contact with the commander on radio. The normal sequence will be: Where – Distance – Reference point – Target.

An example of dialogue would be:

Spotter/observer: "1 o'clock, 450 meters, right 30 mils, large rock, bottom left corner, target is enemy sniper."

Sharpshooter/sniper: "Target identified."

Spotter/observer: "Wind from 2 o'clock, 3 meters pr second."

Sharpshooter/sniper: "Adjusting for wind….. Ready."

Spotter/observer: "Fire/Send it."

Either:

Sharpshooter/sniper: "Shot out, one shot, one kill."

Or:

Spotter/observer: "Bullet hit 1 meter right of target, in line with head."

Sharpshooter/sniper: "Copy, adjusting for wind….. Ready."

Spotter/observer: "Fire/Send it."

Sharpshooter/sniper: "Shot out, two shots, one kill."

SHOT REPORT

When the sharpshooter/sniper fires his shot, the spotter/observer must be ready to report <u>where the bullet hits</u>. If the bullet miss the target, the spotter/observer will tell the sharpshooter/sniper where exactly the bullet lands, in relation of the target position. The spotter/observer CAN NOT give any corrections, to be able to give corrections he should lay in line with the weapon's scope and he should know exatly the sharpshooter/sniper's aiming point, but this is not possible. For this reason, and to be more accurate as possible in his report, the spotter/observer should lay as close as possible to the sharpshooter/sniper, the team has also to develop a proper method of communication, for example:

Target size approximately 60 cm;
Bullet strike 30 cm left;

Spotter/observer: Left, half target.

Or, if the spotter scope has the range finder reticle, the spotter/observer will give the amount of mils between the bullet strike and the target:

Spotter/observer: Left, 5 mils.

The sniper team has to develop their own method and practise it, in order to avoid any kind of misunderstanding and to keep the dialogue as short and clear as possible.

COMMUNICATION

One of the roles of a sharpshooter/sniper team is to gain a good position and feed information back to his commander. In order to achieve this in a tactical situation you must speak clearly and calmly utilising good radio procedure. You must also practise describing structures, suspects and movements to your team leader/commander so that you develop a good method for each case/scenario.

Part 16

Introduction to

Night Vision

Devices (optional)

Introduction to **N**IGHT **V**ISION **D**EVICES

The sniper team uses the NVD to accomplish the following:

-To enhance their observation capability
-To locate and suppress hostile fire at night
-To deny enemy movement at night
-To demoralize the enemy with effective first-round kills at night

There are two basic classes of NVDs:

- ACTIVE
- PASSIVE
  - -Image intensification
  - -Thermal imagery

ACTIVE:

Active system project some type of energy that illuminates the target. Typical systems in this class include searchlights (white or infrared), the AN/PAS-6 metascope, and the M18 binoculars (infrared)

PASSIVE: Image intensification
Thermal imagery

Passive systems do project energy into the target area. Therefore, passive systems cannot be detected except through a visual target indicator such as shine.

Image intensification: (PASSIVE)

Image intensification systems amplify existing light levels as well as detect infrared light sources. Current examples are the AN/PVS-4 night vision sight and the SIMRAD KN 200/KN 250 image intensifier/infrared night vision scopes.

Thermal imagery: (PASSIVE)

Thermal imagery systems convert thermal energy into a visual image. Example are the AN/PAS-7 and the AN/TAS-6 night vision goggles

NOTE:

-The AN/PVS-5 and the AN/PVS-7 night vision goggles are passive systems that contain an active infrared light source. Exercise caution when using these systems so as to avoid giving off a target indicator.

-The AN/PAQ-4 aiming light is not considered an NVD, since its main function is weapon aiming, not target detection/identification

NVDs covered:

-AN/PVS-4

-SIMRAD KN 200/ KN 250

-NSV 80

Steps for each system:

-Mounting the NVD
-Operating procedures
-Procedures for zeroing/bore sighting

AN/PVS-4

Mounting the AN/PVS-4 on the M24 SWS. Use the following procedure to the AN/PVS-4 on the SWS:

-First, you must install the Ultra telescope rail adapter on the device. Remove the mounting block from the device and install the adapter in its place.

-Mount the device on the rifle as you would mount the Ultra M3A1 telescope, tightening the adapter to 65 inch-pounds

The _operating procedures_ for the AN/PVS-4 night vision sight is as follows:

1. With the device mounted on the rifle, install the batteries in the unit. The device can be operated with either two BA-1567/U batteries in the included battery caps or two BA-3058/U batteries (AA cell) in the included adapter placed on the top battery receptacle.
2. Turn the tube brightness and reticle brightness knobs clockwise to place the unit into operation. Adjust the knobs to get the desired sight picture
3. Focus the eyepiece with the diopter focus ring in front of the eyepiece. Focus the target with the objective focus ring behind the control knobs.
4. The reticle in the device has range-finding capabilities. Vertical lines at the top of the reticle indicate range in hundreds of meters of a six-foot-tall standing man.

Measurement is made from the horizontal line to the top or bottom of each vertical line for the range indicated (for targets at 400, 600, 800, and 1000 meters). For a man at 200 meters, use the 400 line from top to bottom

When you have determined the range, select the corresponding aiming point.

<u>For targets 250 meters and closer, use the center of the horizontal lines.</u>

NOTE:

The AN/PVS-4 should be shot using the left eye.

This provides for a better stock weld and keeps the dominant eye from becoming night blind.

The *procedures for zeroing* the AN/PVS-4 to an M-24 sniper rifle is as follows:

1. The minimum recommended range for zeroing the AN/PVS-4 is 25 meters.
2. Fire three rounds at the target to seat the NVD on the rifle. Tighten the mounting nut.
3. Using the Canadian bull target, place the reticle on the desired point of impact and fire a five-round group.
4. From the center of the shot group, adjust the reticle to move the center of the group 2.38 centimeters below the aiming point.The reticle adjustment actuators are marked to indicate the direction of movement for round impact. Each click of windage or elevation will move the strike of the round one minute of angle(0.25 inches at 25 meters).
5. Confirm the zero by firing at a target 250 meters distant. The point of aim and the point of impact should be the same.

Simrad KN 200/250

Mounting the SIMRAD KN 200 on the M24 SWS. Use the following procedures to mount the SIMRAD KN 200 scope on the SWS:

-First, you must install the male dovetail mount on the Ultra M3A1 rifle telescope. Remove the top portion of the front scope ring and replace it with the dovetail.

-Align the female dovetail on the SIMRAD KN 200 with the male dovetail on the Ultra M3A1 telescope. Slide the KN 200 onto the front of the M3A1 as far to the rear as the device will go. When the release snap into the down position, rotate the locking lever down as far as it will go.

-Remove the unit by reversing the steps.

The _operating procedure_ for the SIMRAD KN 200 is as follows:

1. With the device mounted on the SWS, install the batteries in the unit. The device can be operated with either two BA-3042/U (C cell) or two BA-3058/U (AA cell) batteries.
2. Open the daylight cover , turn the device on with the power switch, observe the target through the Ultra M3A1 telescope, and focus the target with the focus ring on the SIMRAD. All elevation and windage adjustments are made with the day optic.

The *procedures for boresighting* the SIMRAD KN 200 is as follows:

1. The recommended range for boresighting the SIMRAD is 100 meters.
2. During ending evening nautical twilight (EENT), remove the daylight cover from the front of the device, open the beam splitter cover on the front of the M3A1 Ultra scope, and focus on a distant target down range.
3. You will see a double image of the target; if the images overlap, your device is boresighted. If the images do not overlap, you must boresight the device. Using the windage and elevation adjusters on the front of the SIMRAD, make the images overlap. If your SIMRAD does not have the adjusters, you must send the device back to the manufactures for boresighting.

-NOTE:

ALL ADJUSTMENTS ARE NOW MADE WITH WINDAGE AND ELEVATION KNOBS ON THE M3A1 ULTRA TELESCOPE.

4. During the hours of darkness, using a target with clearly visible minute of angle aiming point, fire a five-round group at your aiming point.
5. The strike of the round will be 3.75 inches below the point of aim at all ranges due to the height of the SIMRAD above the scope.
6. You can adjust the strike of the round to coincide with the point of aim. Work up data for each firing line and record it for later use in the field.

NSV 80

Mounting **the NSV 80 on the G22 SWS. Use the following procedures to mount the NSV 80 on the SWS:**

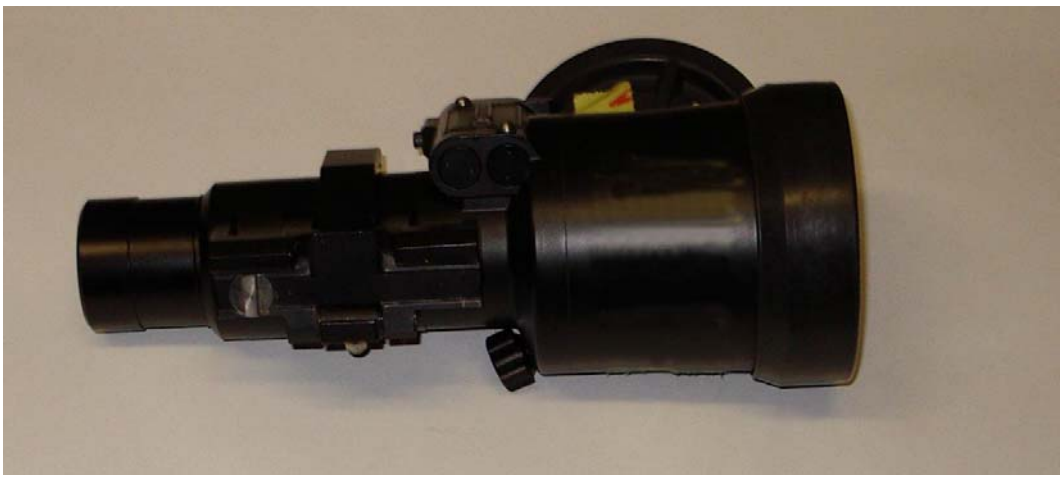
-First, you must install the male dovetail mount on the Ultra M3A1 rifle telescope. Remove the top portion of the front scope ring and replace it with the dovetail.

-Align the female dovetail on the SIMRAD KN 200 with the male dovetail on the Ultra M3A1 telescope. Slide the KN 200 onto the front of the M3A1 as far to the rear as the device will go. When the release snap into the down position, rotate the locking lever down as far as it will go.

-Remove the unit by reversing the steps.

The *operating procedure* for the NSV 80 is as follows:

1. With the device mounted on the SWS, install the batteries in the unit. The device can be operated with either two BA-3042/U (C cell) or two BA-3058/U (AA cell) batteries.
2. Open the daylight cover , turn the device on with the power switch, observe the target through the Ultra M3A1 telescope, and focus the target with the focus ring on the SIMRAD. All elevation and windage adjustments are made with the day optic.



The *procedures for boresighting* the NSV 80 is as follows:

1. The recommended range for boresighting the NSV 80 is 100 meters.
2. During ending evening nautical twilight (EENT), remove the daylight cover from the front of the device, open the beam splitter cover on the front of the NSV 80, and focus on a distant target down range.
3. You will see a double image of the target; if the images overlap, your device is boresighted. If the images do not overlap, you must boresight the device. Using the windage and elevation adjusters on the front of the NSV 80, make the images overlap. If your NSV 80 does not have the adjusters, you must send the device back to the manufactors for boresighting.

-NOTE:

ALL ADJUSTMENTS ARE NOW MADE WITH WINDAGE AND ELEVATION KNOBS ON THE NSV 80.

4. During the hours of darkness, usinga target with clearly visible minute of angle aiming point, fire a five-round group at your aiming point.
5. The strike of the round will be 3.75 inches below the point of aim at all ranges due to the height of the NSV 80 above the scope.
6. You can adjust the strike of the round to coincide with the point of aim. Work up data for each firing line and record it for later use in the field.

Employment factors

Since the sight requires target illumination and does not project its own light source, it will not function in total darkness. The sight works best on a bright, moonlight night. When there is no light or the ambient light is very low (such as in heavy vegetation), the use of artificial or infrared light improves the sight's performance

REMEMBER THAT…

-Fog, smoke, dust, hail or rain limit the range and decrease the resolution of the instrument.

-The sight does not allow seeing through objects in the field of view. For example, the operator will experience the same range restrictions when viewing dense wood lines as he would using other optical sight.

-The observer may experience eye fatigue when viewing for prolonged periods.

Viewing should be limited to 10 minutes, followed by a rest of 10 minutes. After several periods of viewing, the observation time limit can be safely extended. To aid in maintaining continuous observation and reduce eye fatigue, the observer should alternate his viewing eyes often.

The NVD does not give the width, depth, or clarity of daytime optics. However, a well-trained operator can see enough to analyze the tactical situation, detect enemy targets, and engage targets effectively.

-On a passive NVDs, the image intensifier tube will automatically shut off when exposed to intense light to protect the operator's eyes and to prevent tube burnout.

-Never aim the NVD at the direct sun (with image intensifier tube on or off), as this could result in a complete failure of the tube.

-Always have the eye resting on the eyecup or have eyecup in place to prevent a green light from being projected onto your face, which would make an excellent target for an enemy sniper.

Part 17

Alternate Sniper

Weapon Systems

(optional)

Part 18

Sniper in Urbanised environment

Sniping on Urbanized Terrain

Description of the terrain :
Observation & FF : Best observation from the top of the buildings , buildings with numerous windows provide the best field of fire.
Cover & Concealment : Buildings with brick walls and few , narrow windows provide the best balance between cover and concealment . Roofs provide little protection
Obstacles : Doors , furniture , barbed wire .
Key control Points : Entrances , hallways , stairs .
Avenues of Approach : The best way to gain entry into a building is from the top (fire escapes , drainpipes , adjacent buildings)

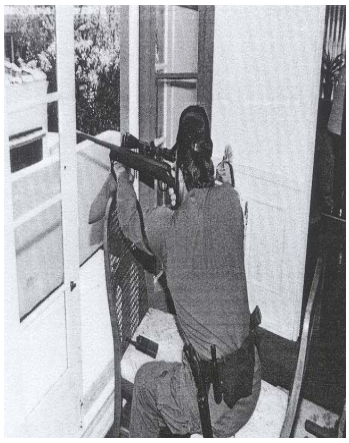
Operations in UT require detailed intelligence and the sources from which we are going to draw information out are :

1. Maps (especially city's civilians maps -tourist maps)
2. Aerial photos
3. Civil government and Local Military info like :
4. Large-scale city maps
5. Diagram of underground sewer

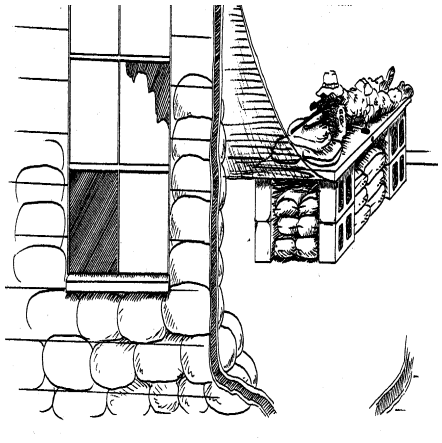
Terrain :
The **Environmental Considerations** that should be evaluated for the selection and the effectiveness of the Urban Sniper Hide are :

1. Population density Safety of local civilian population
2. Pet animals (dogs , pigeons)
3. Media (Heli TV)
4. Glass or window removal
5. Artificial lighting will impact on the effectiveness of the NVD's
6. Noise level in the area

Camouflage Techniques : the Sniper must study the surroundings in the area to properly camouflage himself . If there is no damage don't make one especially on the outer appearance of the buildings .
Sniper must **Use the shadows** to aid in concealment during movement . He will avoid lighted areas around windows and loopholes .



Wrong



Right

The **Color and texture** are important factors of urban camouflage . Predominant colors are : browns , tans , grays rather than greens . Each camouflage location should be evaluated separately . Use burlap or canvas than foliage .

Dust : use a wet blanket , canvas or any type of cloth to cover the area around the muzzle .

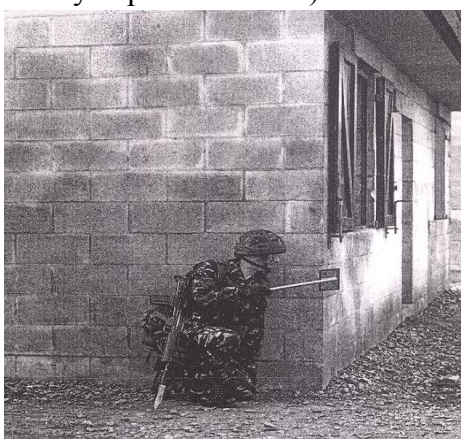
Background : pay attention to the background to ensure that you are not skylined or silhouetted .

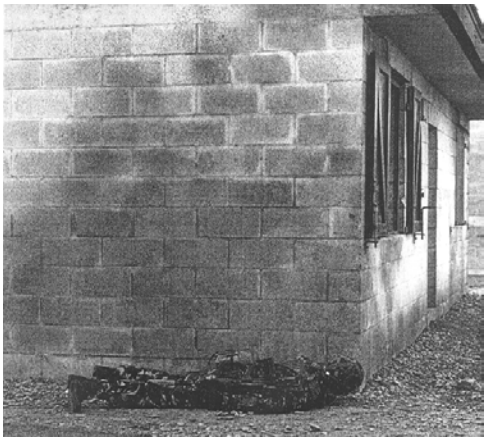
Wrong background

Movement Techniques

Crossing a Wall (roll over the wall after you have reconnoitered the other side – speed-low silhouette)

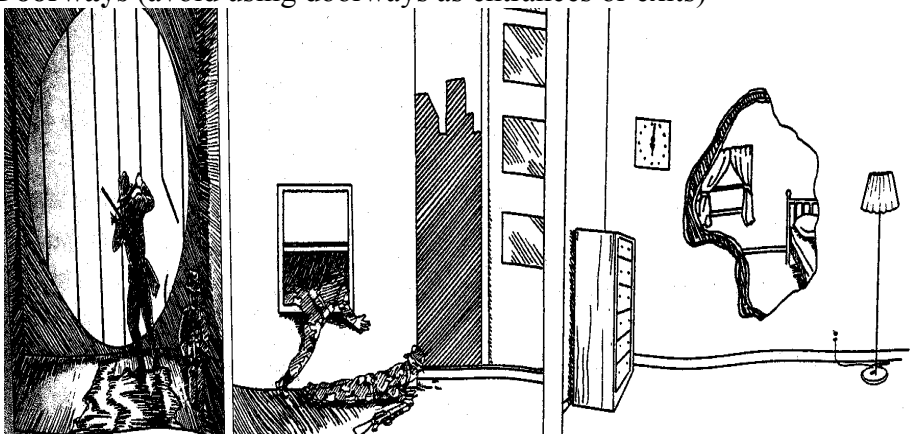
Moving around a corner (use a mirror – don't expose your head at the height the enemy expects to see it)





Moving Past Windows (stay below the window level)

Using Doorways (avoid using doorways as entrances or exits)



Use the same techniques as in woodland stalking .

<u>Building Entry Techniques</u>

Reach the top levels without using the doorways and the stairs . Beware of : Booby traps , Alarm systems , Fire barriers .

Use **ladders** :

Use **hooks** with **knotted ropes** :

Use **climbing** or **rappelling** techniques.
Use **fast rope** technique to reach the roofs of adjoining buildings.

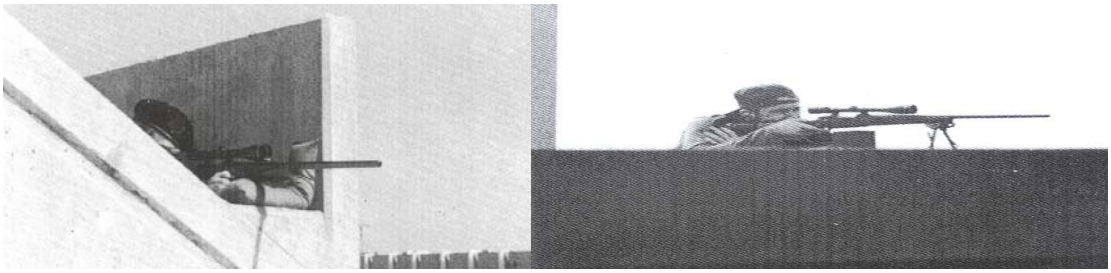
Urban Hides

There are two types of urban hides:

1. Hasty Hides

Firing from corners of buildings .

Firing from behind walls (not over)



Right **Wrong**

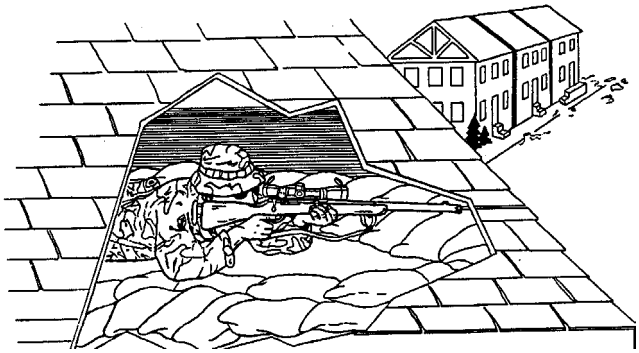
Firing from windows .

Firing from an unprepared loophole or firing when no cover is available .

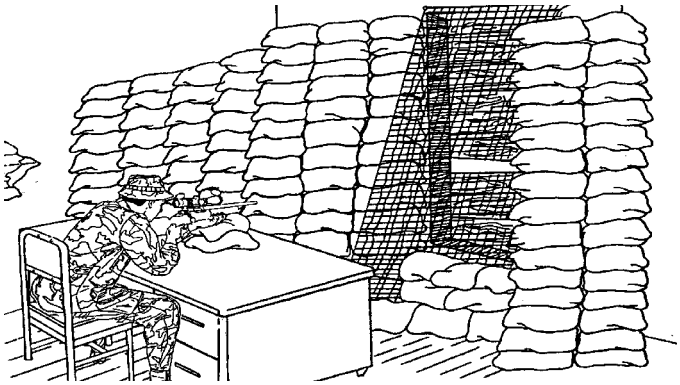
Firing from the Peak of a Roof

2. Prepared Hides

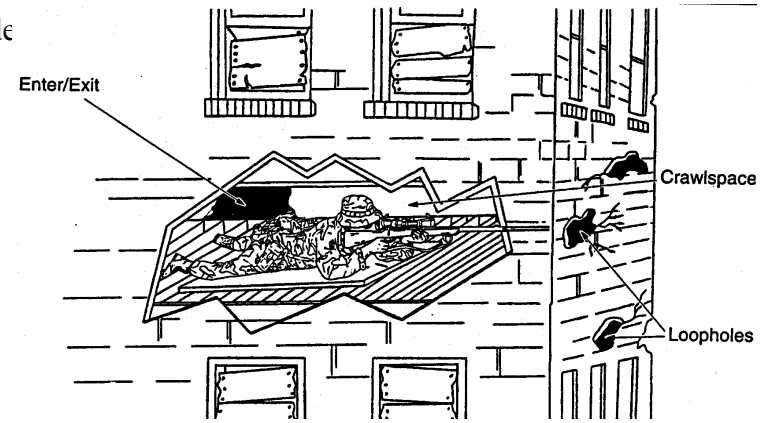
Roof hide



Room hide



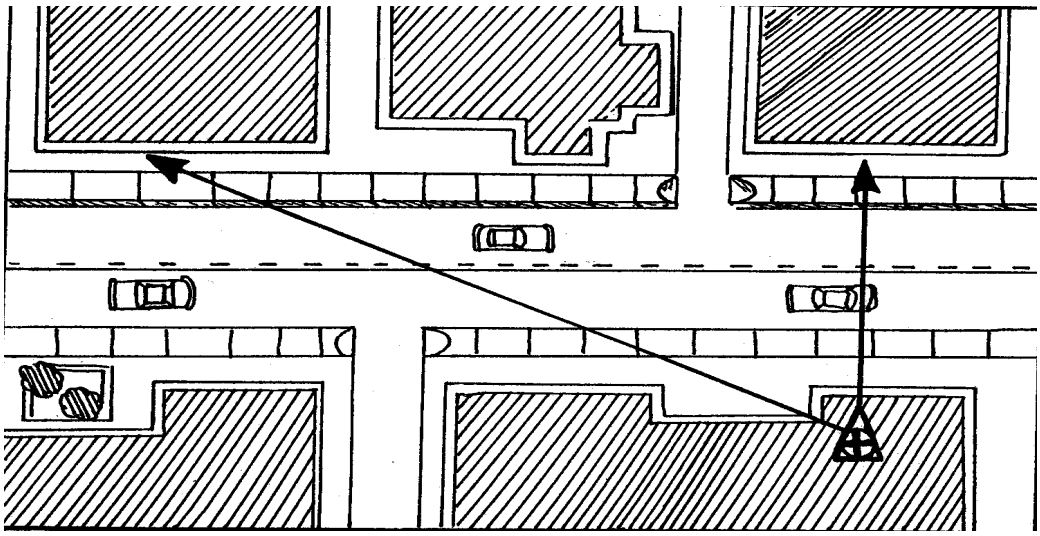
Crawl space hide



Sniper Techniques in Urban Hides

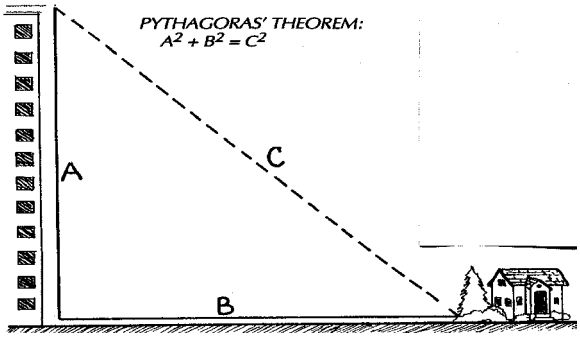
Second floor of a building is usually the best location for the position of the sniper . Do not clean the windows . Do not remove curtains .Boresight your rifle through the loophole . Use blankets to make partitions to a big room (shooting room , rest and eating room , restroom) .Always plan for escape route to the ORP.Don't forget your garbage (rats) . Take advantage from the furniture to make your rifle stable .

Exploit your rifle's ballistics advantages (distances bigger than 200m) and make a side-facing sector that it will place your fire at an odd angle .



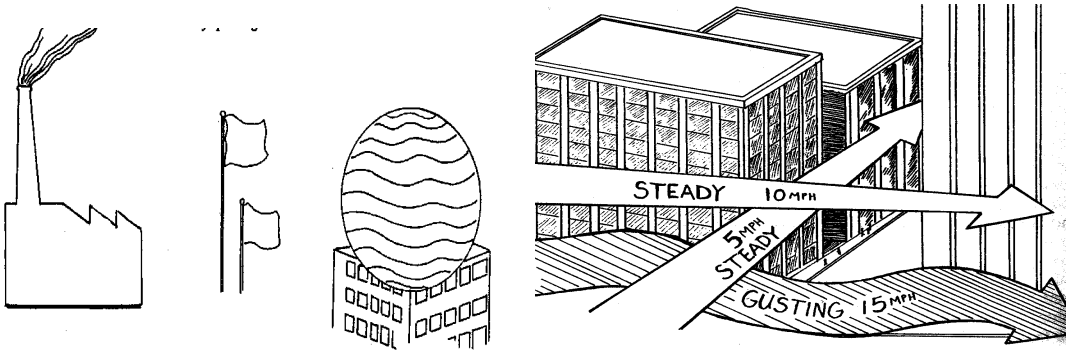
Urban Range Estimation

Use the slope firing technique when it is necessary . Use the Pythagoras Theorem and the Sinus formula .



Wind Estimation

Use the smoke from the industries , flags when they are available and the mirage on the top of the buildings as wind indicators . Urban winds are sometimes confusing .



Winds become steadier with elevation .Rooftops winds tend to be steady .Downtown buildings act like man made canyons and the wind is guided between them . Avoid shooting through a major urban intersection . Be sensitive to winds passing through

porous buildings (parking ramps) . The wind around a short building surrounded by tall ones is twisted .

Target Indication

When you are putting in place your radio keep in mind that the antennas (especially Satcom antennas) is a perfect indicator for the enemy . Noise especially at night can indicate your position .

Make a code :

RED : Do not shoot

YELLOW : Shoot in defense of life only

GREEN : Shoot on shight

Establish a simple system to indicate the target like the one in the following picture .

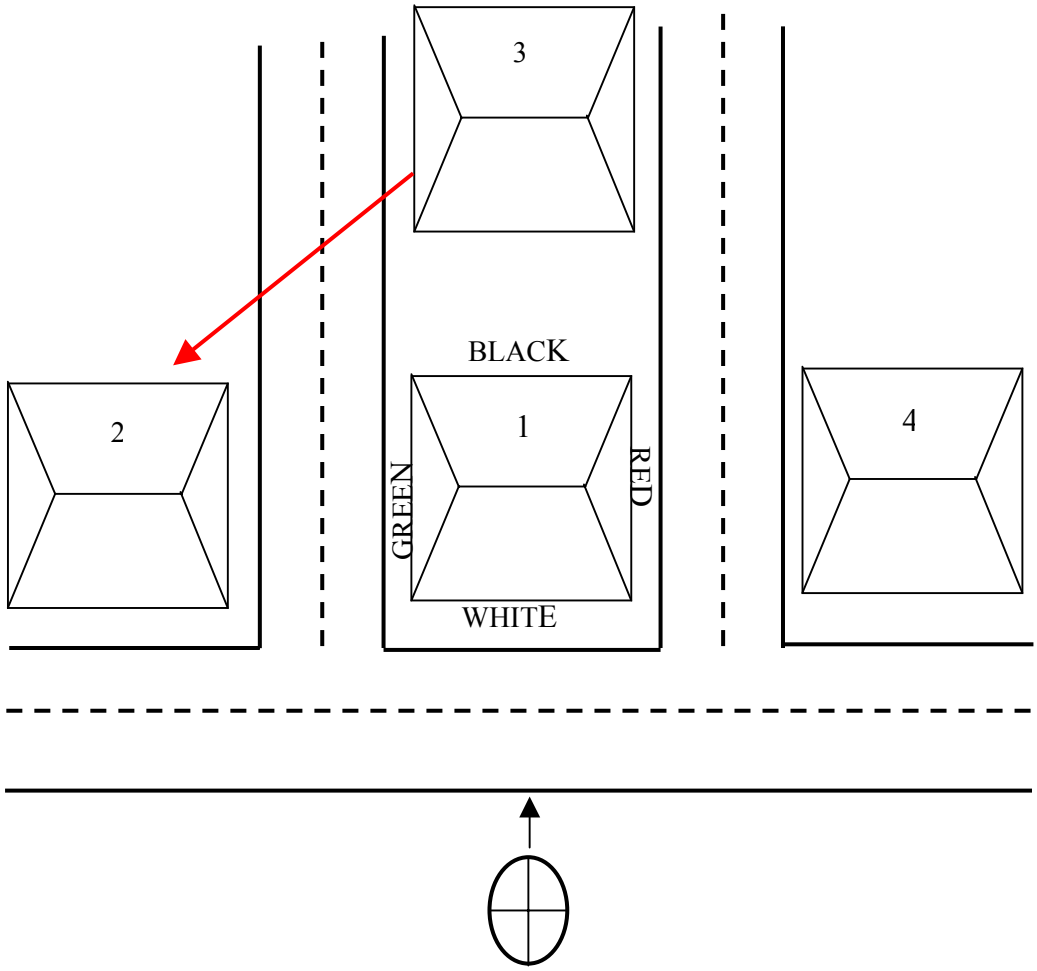
A house has basically four sides seen from the sniper:

FRONT: White

BACK: Black

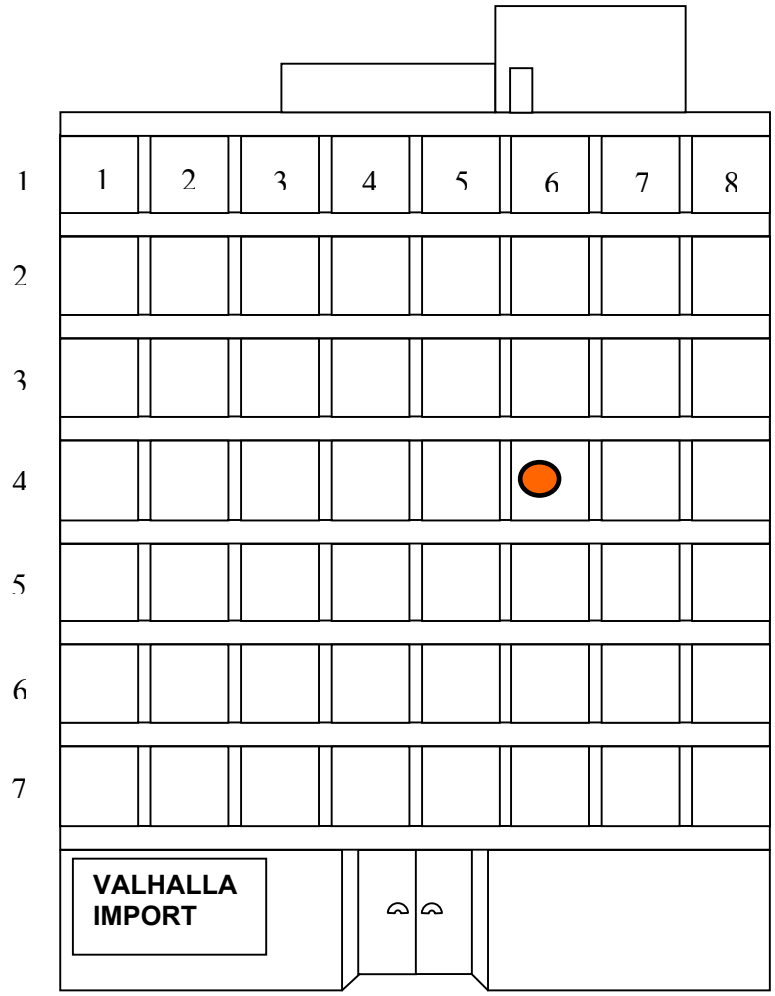
LEFT: Green

RIGHT: Red



"Target is moving from 3 Green towards 2 Black"

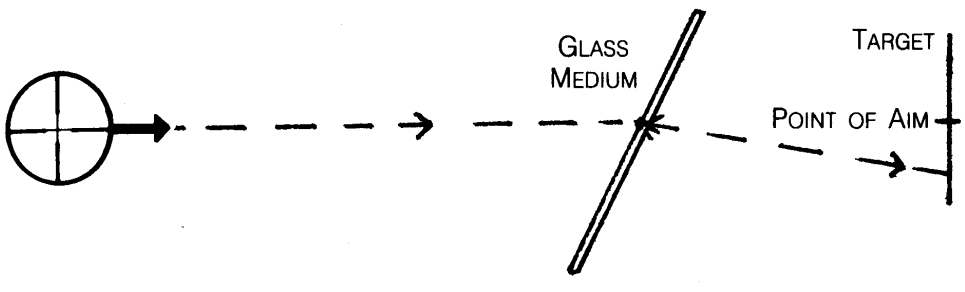
For indicating specific points – windows on big buildings use the following technique:



"Valhalla Import 46 (four six)" would mean the Valhalla Import building down 4 floors and in from the left 6 windows. We count from the top for two reasons: (1) hostile snipers generally positions themselves high in a building to maximise their advantage, and (2) to avoid the confusion of whether the ground floor or the first row of windows is the first floor. Also some buildings are built on sloping terrain so downhill side may have one or two more floors.

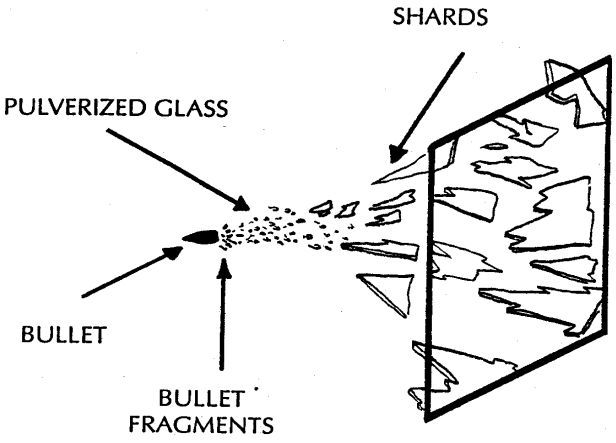
Glass Shooting

After penetration the bullet tend to curve slightly . The angle of deflection depends on the angle of penetration .Get best results with perpendicular fire .



DEFLECTION EXAGGERATED FOR ILLUSTRATION

When planning a hostage rescue shot , take into account the danger of secondary missiles : Pulverized glass and Bullet fragments .



Part 19

ISTC Sniper Course

References / Sniper Schools

and contacts

ITSC SNIPER COURSE REFERENCES

The Ultimate Sniper
An Advanced Training Manual for Military and Police Snipers
Major John L. Plaster , USAR (Ret.)
ISBN 0-87364-704-1 (Paladin Press, Boulder, Colorado, USA)

Sniper Counter Sniper
A Guide for Special Response Teams, Specialized Tactical Training Unit
Mark V. Lonsdale
ISBN 0-7394-0359-1

Sniper II
Specialized Tactical Training Unit
Mark V. Lonsdale
ISBN 0-939235-05-6 (USA)

US Army Special Operations Target Interdiction Course
Sniper Training and Employment
ISBN 1-58160-043-7 (Paladin Press, Boulder, Colorado, USA)

FM 23-10
Sniper Training
US Army 17 Aug 1994

FMFM1-3B
US Marine Corps Sniping
Lancer Militaria, PO Box 886, Mt Ida, AR 71957, USA

US Marine Corps Scout/Sniper
Training Manual
Desert Publications, El Dorado, AR 71731-1751 USA

Infantry Training, Volume 1
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Pamphlet no. 4 Sniping
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Army Code No. 70739, D/HQDT/18/28/56, revised 1996

TC 31-32
Special Operations Sniper
Training and Emloyment
US Army

Army Field Manual
Operations in Special Environments, Volume IV

Part 5 Operations in Built-Up Areas (OBUA)
Army Code No 71346 (Pt 5), D/DGD&D 18/34/26

Scarfschützen Schießtechnik
Die Schießausbildung der Scharfschützen
Gestern und Heute, Teil 1 und 2
Von Siegfried F. Hüber
ISBN 3-923995-16-4 (WSV–Verlag Kienesberger, Nürnberg)

ZDv 3/132 VS-NfD
Das Scharfschützengewehr G22
Juli 1999, DSK HH150120035

Operating Instructions Telescopic Sight 3-12x56 G22
Opln 330196
Hensoldt Systemtechnik Gmt
Nr 1240-12-334-9850

Accuracy International Sniper Rifle
Users Manual, English
Model Super Magnum
From Supplier

Schools and Units

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Training Division
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Los Angeles
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Hampshire, England PO3 5SJ

Websites

www.sniperworld.com

Part 20

Data Book

COMPUTING Minute of Angel (MOA)

		Mils	Degree	MOA
1	**Mils**	1	0,056	3,375
1	**Degree**	17,78	1	60
1	**MOA**	0,296	0,017	1

Meters

Mils=MOA/3.375

MOAxR=Inches R=actual range

Range m	1 MOA	
100	3	Cm.

Yards

Range y	1 MOA	
100	1	In.

NSN	Scope	Weapon	Click	Range m	MOA	Error Inches	Mils	Error cm
1240-12-334-9850	Henslot Wetzlar XF 3-12X56	G-22	1	100	1,5	0,59	0,44	1,5
1240-12-334-9850	Henslot Wetzlar XF 3-12X56	G-22	1	1000	30	5,91	8,89	15

Computing Distance

Input	Distance	Meter	Mile	Yard	Feet	Inch	Nautical Mile
1	**Meter**	1	0,00062	1,09	3,28084	39,37	0,00054
1	**Mile**	1609,3	1	1760	5280	190080	0,86898
1	**Yard**	0,914	1760	1	3	36	0,00065
1	**Feet**	0,3048	0,00019	0,33333	1	12,00	
1	**Inch**	0,0254	0,00001	0,02778	0,083	1	
1	**Nautical Mile**	1852	1,15	2025			1

COMPUTING Speed/Velocity

Input	Velocity	Meter/Sec	Km/Hour	Yards/Sec	Miles/Hour	Knot
1	**Meter/Sec**	1	3,6000	1,0936	2,2369	1,9439
1	**Km/Hour**	0,2778	1	0,3038	0,6214	0,5400
1	**Yards/Sec**	0,9144	3,2918	1	2,0455	
1	**Miles/Hour**	0,4470	1,6093	0,4888	1	
1	**Knot(NauM/H)**	0,5144	1,8520			1

COMPUTING Weight

Input	Weight	Tonne	Kg Kilogram	g gram	lb pound	gr grain	pz ounce
1	**Tonne**	1	1000	1000000	2204,62		
1	**Kg Kilogram**	0,001000	1	1000	2,204623		
1	**g gram**	0,000001	0,001000	1	0,002205	0,064799	0,035274
1	**lb pound**	0,000454	0,454	453,51	1	0,000143	16
1	**gr grain**			15,43	7000	1	0,002286
1	**pz ounce**			28,35	0,062500	437,50	1

Table of Mils

Feet	0,5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Meter	**0,15**	**0,30**	**0,61**	**0,91**	**1,22**	**1,52**	**1,83**	**2,13**	**2,44**	**2,74**	**3,05**	**3,35**	**3,66**	**3,96**	**4,27**	**4,57**	**4,88**	**5,18**	**5,49**	**5,79**	**6,10**
Mils																					
0,50	305	610	1219	1829	2438	3048	3658	4267	4877	5486	6096	6706	7315	7925	8534	9144	9754	10363	10973	11582	12192
1,00	152	305	610	914	1219	1524	1829	2134	2438	2743	3048	3353	3658	3962	4267	4572	4877	5182	5486	5791	6096
1,50	102	203	406	610	813	1016	1219	1422	1626	1829	2032	2235	2438	2642	2845	3048	3251	3454	3658	3861	4064
2,00	76	152	305	457	610	762	914	1067	1219	1372	1524	1676	1829	1981	2134	2286	2438	2591	2743	2896	3048
2,50	61	122	244	366	488	610	732	853	975	1097	1219	1341	1463	1585	1707	1829	1951	2073	2195	2316	2438
3,00	51	102	203	305	406	508	610	711	813	914	1016	1118	1219	1321	1422	1524	1626	1727	1829	1930	2032
3,50	44	87	174	261	348	435	523	610	697	784	871	958	1045	1132	1219	1306	1393	1480	1568	1655	1742
4,00	38	76	152	229	305	381	457	533	610	686	762	838	914	991	1067	1143	1219	1295	1372	1448	1524
4,50	34	68	135	203	271	339	406	474	542	610	677	745	813	881	948	1016	1084	1151	1219	1287	1355
5,00	30	61	122	183	244	305	366	427	488	549	610	671	732	792	853	914	975	1036	1097	1158	1219
5,50	28	55	111	166	222	277	333	388	443	499	554	610	665	720	776	831	887	942	998	1053	1108
6,00	25	51	102	152	203	254	305	356	406	457	508	559	610	660	711	762	813	864	914	965	1016
6,50	23	47	94	141	188	234	281	328	375	422	469	516	563	610	656	703	750	797	844	891	938
7,00	22	44	87	131	174	218	261	305	348	392	435	479	523	566	610	653	697	740	784	827	871
7,50	20	41	81	122	163	203	244	284	325	366	406	447	488	528	569	610	650	691	732	772	813
8,00	19	38	76	114	152	191	229	267	305	343	381	419	457	495	533	572	610	648	686	724	762
8,50	18	36	72	108	143	179	215	251	287	323	359	394	430	466	502	538	574	610	645	681	717
9,00	17	34	68	102	135	169	203	237	271	305	339	373	406	440	474	508	542	576	610	643	677
9,50	16	32	64	96	128	160	193	225	257	289	321	353	385	417	449	481	513	545	578	610	642
10,00	15	30	61	91	122	152	183	213	244	274	305	335	366	396	427	457	488	518	549	579	610
10,50	15	29	58	87	116	145	174	203	232	261	290	319	348	377	406	435	464	493	523	552	581
11,00	14	28	55	83	111	139	166	194	222	249	277	305	333	360	388	416	443	471	499	526	554
11,50	13	27	53	80	106	133	159	186	212	239	265	292	318	345	371	398	424	451	477	504	530
12,00	13	25	51	76	102	127	152	178	203	229	254	279	305	330	356	381	406	432	457	483	508
12,50	12	24	49	73	98	122	146	171	195	219	244	268	293	317	341	366	390	415	439	463	488
13,00	12	23	47	70	94	117	141	164	188	211	234	258	281	305	328	352	375	399	422	445	469
13,50	11	23	45	68	90	113	135	158	181	203	226	248	271	294	316	339	361	384	406	429	452
14,00	11	22	44	65	87	109	131	152	174	196	218	239	261	283	305	327	348	370	392	414	435
14,50	11	21	42	63	84	105	126	147	168	189	210	231	252	273	294	315	336	357	378	399	420
15,00	10	20	41	61	81	102	122	142	163	183	203	224	244	264	284	305	325	345	366	386	406
15,50	10	20	39	59	79	98	118	138	157	177	197	216	236	256	275	295	315	334	354	374	393
16,00	10	19	38	57	76	95	114	133	152	171	191	210	229	248	267	286	305	324	343	362	381
16,50	9	18	37	55	74	92	111	129	148	166	185	203	222	240	259	277	296	314	333	351	369
17,00	9	18	36	54	72	90	108	126	143	161	179	197	215	233	251	269	287	305	323	341	359
17,50	9	17	35	52	70	87	105	122	139	157	174	192	209	226	244	261	279	296	314	331	348
18,00	8	17	34	51	68	85	102	119	135	152	169	186	203	220	237	254	271	288	305	322	339
18,50	8	16	33	49	66	82	99	115	132	148	165	181	198	214	231	247	264	280	297	313	330
19,00	8	16	32	48	64	80	96	112	128	144	160	176	193	209	225	241	257	273	289	305	321
19,50	8	16	31	47	63	78	94	109	125	141	156	172	188	203	219	234	250	266	281	297	313
20,00	8	15	30	46	61	76	91	107	122	137	152	168	183	198	213	229	244	259	274	290	305

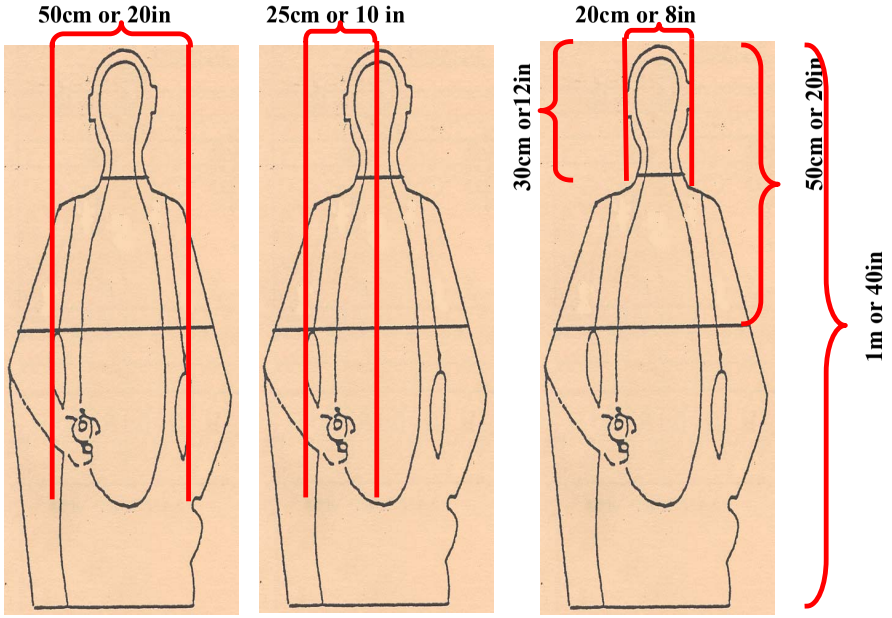
To use:

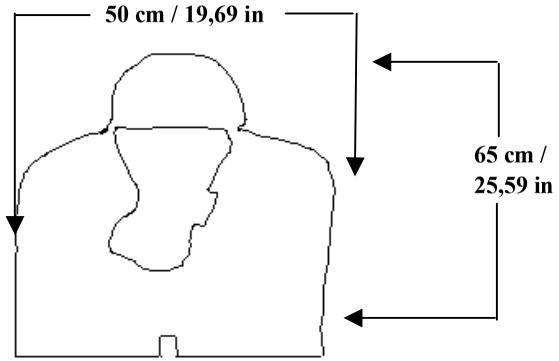
Estimate height of target and locate across the top
Measure height of the object in mils and locate down the side
Join top and side figs for range to raget

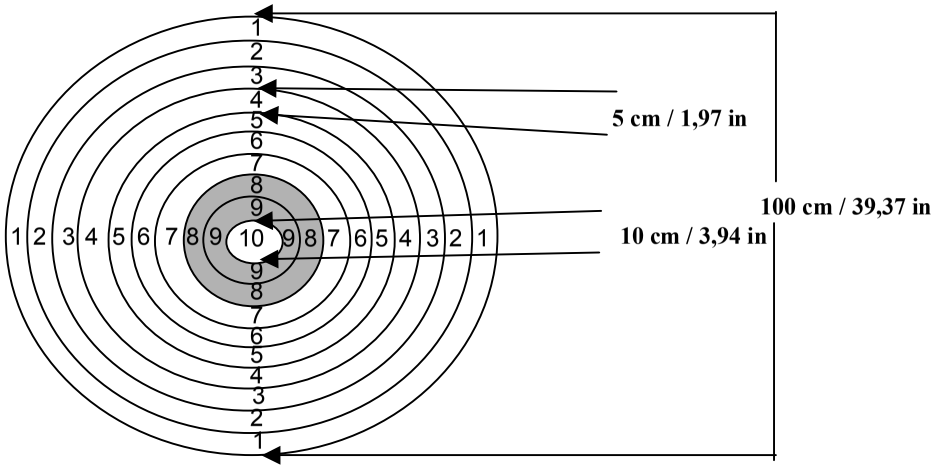
FORMULA

$$\frac{\text{Height of target (m)} \times 1000}{\text{height of target (mils)}} = \text{Range (m)}$$

Dimensions of Targets







Formula Quick Reference

Range Estimation:

Meters $\frac{\text{height or width (inch.)} * 25{,}4}{\text{Mils}} =$ Range in Meters

Meters 2 $\frac{\text{height in meters} * 1000}{\text{Mils}} =$ Range in Meters

Yards To Meters yards * 0,9144 = range in meters

Wind Formula **Full value wind** $\frac{\text{range (1st digit)} * \text{velocity (mph)}}{\text{constant}} =$ MOA

Wind Constants 308	
100-500m =	15
600m =	14
700-800m =	13
900m =	12
1000m =	11

Convert MOA to Mil $\frac{\text{MOA}}{3{,}375} =$ Mil

R	Range in m (6=600)
V	Velocity in m/s
C	Constant 10
Formula	R*(V*2.2369)/C=MOA
Formula 2	R*(m/s)/15=mils

Target Lead

time of flight	
100m=.1 sec	600m=.9 sec
200m=.2 sec	700m=1.0 sec
300m=.4 sec	800m=1.3 sec
400m=.5 sec	900m=1.5 sec
500m=.7 sec	1000m=1.8 sec

1st step *time of flight* * *target speed* = *lead in feet*

2nd step *lead in feet* * *0,3048* = *lead in meters*

3rd step $\frac{\textbf{\textit{lead in meters}} * \textbf{\textit{1000}}}{\textbf{\textit{range}}} =$ ***mil lead***

Target Speed

slow patrol =1fps (0,3 m/sec , 1,08km/h)
fast patrol = 2fps (0,61 m/sec , 2,2 km/h)
slow walk = 4fps (1,22 m/sec, 4,39 km/h)
fast walk = 6fps (1,83 m/sec, 6,59 km/h)
run = 11fps (3,35 m/sec, 12,06 km/h)

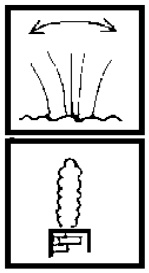
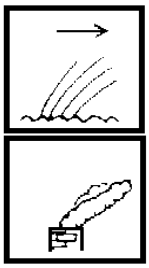
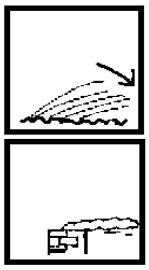
time of flight AC 51 (13 gramm)G22	
100 m = 0,115 sec	600 m = 0,820 sec
200 m = 0,237 sec	700 m = 0,995 sec
300 m = 0,368 sec	800 m = 1,184 sec
400 m = 0,508 sec	900 m = 1,389 sec
500 m = 0,658 sec	1000 m = 1,611 sec

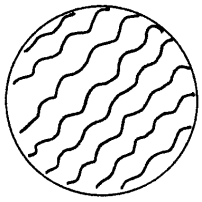
or

target speed per second (in Mil) * flight time = lead in mil

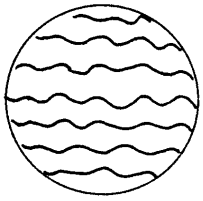
example: *Range 400* *target speed 5 mil per second*

5 x 0,5(08) = 2,5(4) mil lead *hold off 2,5 mil*

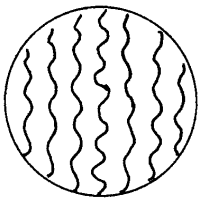
Slow 0 - 3 m/sec	Fast 4 - 8 m/sec	Very Fast 9 - 12 m/sec
		



Slow
0-3 m/sek



Fast
4-8 m/sek



Boiling
kein Wert

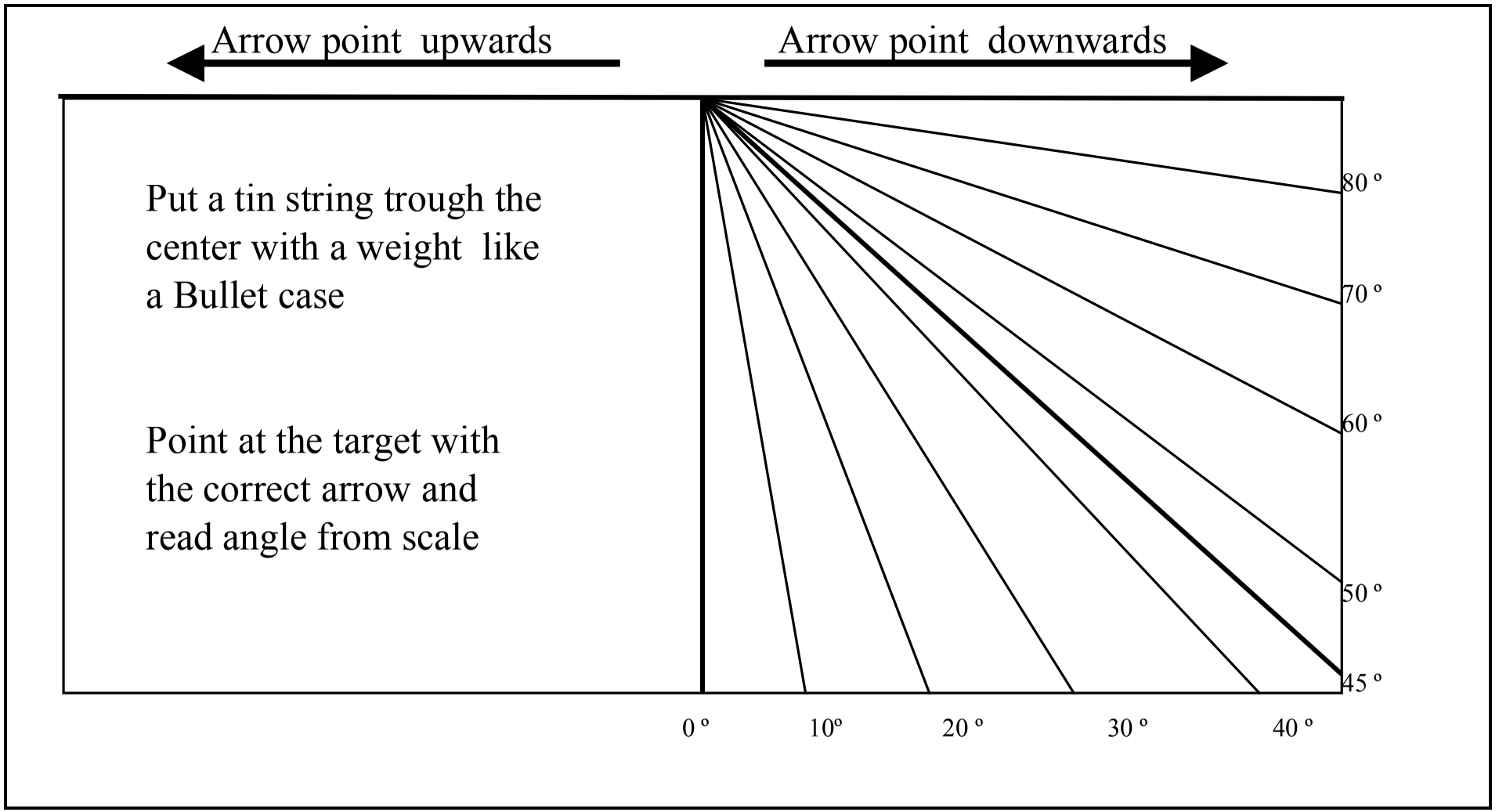
1-2 m/sec	Smoke rise straight up
2-4 m/sec	Felt Slightly on face
4-6 m/sec	Leafs agitate contineuesly
6-8 m/sec	Small branches moving
8-10 m/sec	Small trees sway

COMPUTING Sinus of an Angle

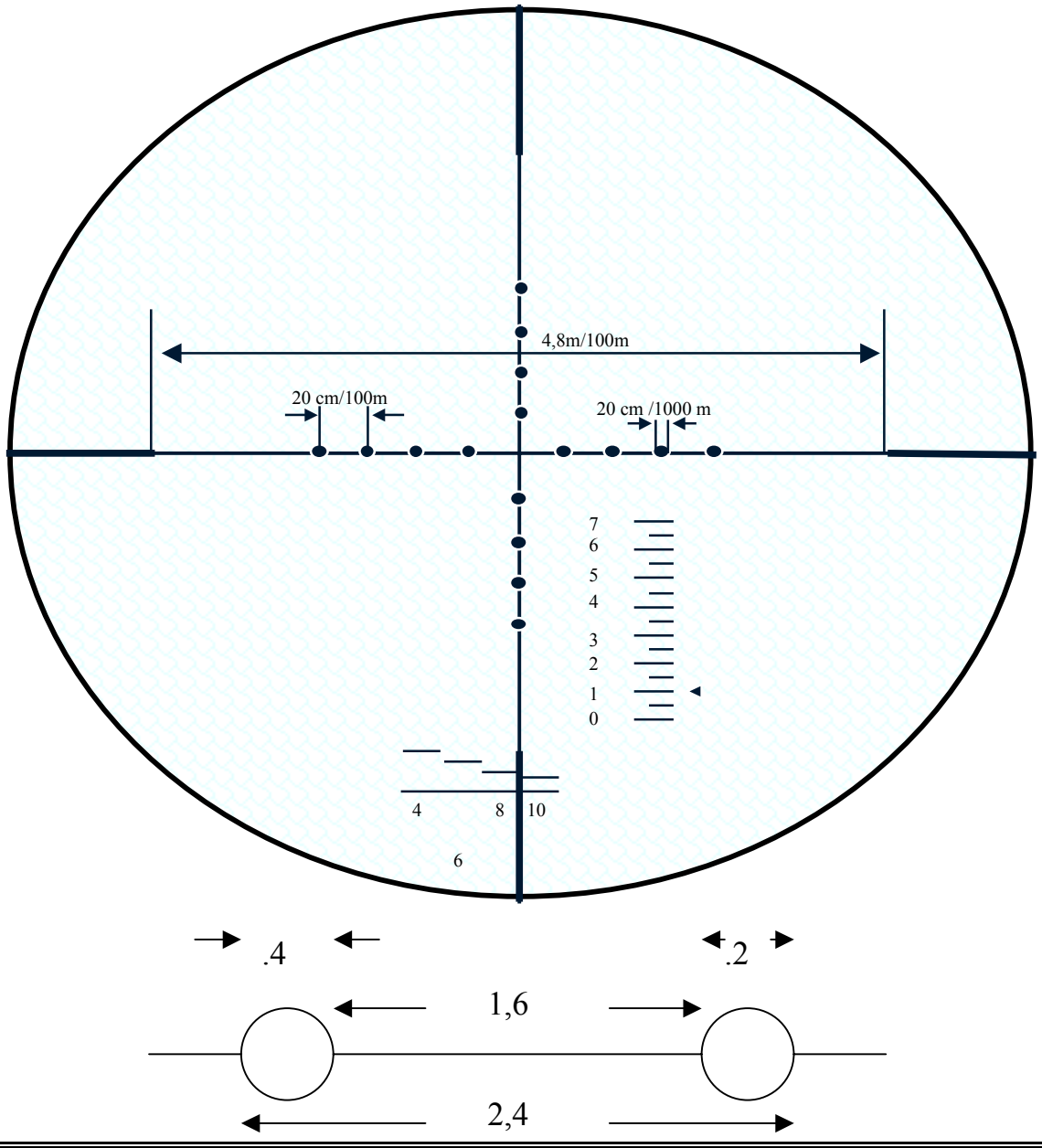
Angle	Sinus
1	0,01745
2	0,03490
3	0,05234
4	0,06976
5	0,08716
6	0,10453
7	0,12187
8	0,13917
9	0,15643
10	0,17365
11	0,19081
12	0,20791
13	0,22495
14	0,24192
15	0,25882
16	0,27564
17	0,29237
18	0,30902
19	0,32557
20	0,34202
21	0,35837
22	0,37461
23	0,39073
24	0,40674
25	0,42262
26	0,43837
27	0,45399
28	0,46947
29	0,48481
30	0,50000

Angle	Sinus
31	0,51504
32	0,52992
33	0,54464
34	0,55919
35	0,57358
36	0,58779
37	0,60182
38	0,61566
39	0,62932
40	0,64279
41	0,65606
42	0,66913
43	0,68200
44	0,69466
45	0,70711
46	0,71934
47	0,73135
48	0,74314
49	0,75471
50	0,76604
51	0,77715
52	0,78801
53	0,79864
54	0,80902
55	0,81915
56	0,82904
57	0,83867
58	0,84805
59	0,85717
60	0,86603

Angle	Sinus
61	0,87462
62	0,88295
63	0,89101
64	0,89879
65	0,90631
66	0,91355
67	0,92050
68	0,92718
69	0,93358
70	0,93969
71	0,94552
72	0,95106
73	0,95630
74	0,96126
75	0,96593
76	0,97030
77	0,97437
78	0,97815
79	0,98163
80	0,98481
81	0,98769
82	0,99027
83	0,99255
84	0,99452
85	0,99619
86	0,99756
87	0,99863
88	0,99939
89	0,99985
90	1,00000


Arrow point upwards
Arrow point downwards
Put a tin string trough the center with a weight like a Bullet case
Point at the target with the correct arrow and read angle from scale
80 º
70 º
60 º
50 º
45 º
0 º
10º
20 º
30 º
40 º

Henslot Wetzlar XF 3-12X56



WIND TABLE FOR G-22

7,62X 67 DM 121 VM (AC 51)

VO= 895 m/s

		2	4	6	8	10	2	4	6	8	10	
Range	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Clicks**	**Range**
100	**5**	0	0	0	0	0	0	0	0	0	0	**100**
125	**6**	0	0	0	0	1	0	0	0	0	0	**125**
150	**7**	0	0	0	0	1	0	0	0	1	1	**150**
175	**8**	0	1	1	1	2	0	1	1	1	1	**175**
200	**9**	0	1	1	2	2	0	1	1	1	2	**200**
225	**10**	1	1	2	2	3	0	1	1	2	2	**225**
250	**12**	1	1	2	3	4	1	1	2	2	3	**250**
275	**13**	1	2	3	3	4	1	1	2	2	3	**275**
300	**14**	1	2	3	4	5	1	1	2	3	3	**300**
325	**15**	1	2	3	5	6	1	2	2	3	4	**325**
350	**16**	1	3	4	5	6	1	2	3	4	4	**350**
375	**18**	1	3	4	6	7	1	2	3	4	5	**375**
400	**19**	2	3	5	6	8	1	2	3	4	5	**400**
425	**20**	2	3	5	7	8	1	2	4	5	6	**425**
450	**22**	2	4	6	7	9	1	3	4	5	6	**450**
475	**23**	2	4	6	8	10	1	3	4	6	7	**475**
500	**25**	2	4	6	9	11	2	3	5	6	7	**500**
525	**26**	2	5	7	9	11	2	3	5	6	8	**525**
550	**28**	2	5	7	10	12	2	3	5	7	9	**550**
575	**29**	3	5	8	10	13	2	4	6	7	10	**575**
600	**31**	3	6	8	11	14	2	4	6	8	11	**600**
625	**32**	3	6	9	12	15	2	4	6	8	10	**625**
650	**34**	3	6	9	12	16	2	4	7	9	11	**650**
675	**36**	3	7	10	13	16	2	5	7	9	11	**675**
700	**37**	3	7	10	14	17	2	5	7	10	12	**700**
725	**39**	4	7	11	15	18	3	5	8	10	13	**725**
750	**41**	4	8	11	15	19	3	5	8	11	13	**750**
775	**42**	4	8	13	16	20	3	6	8	11	14	**775**
800	**45**	4	8	13	17	21	3	6	9	12	15	**800**
825	**47**	4	9	13	17	22	3	6	9	12	15	**825**
850	**49**	5	9	14	18	23	3	6	10	13	16	**850**
875	**51**	5	10	14	19	24	3	7	10	13	17	**875**
900	**53**	5	10	15	20	25	3	7	10	14	17	**900**
925	**56**	5	10	16	21	26	4	7	11	15	18	**925**
950	**58**	5	11	16	22	27	4	8	11	15	19	**950**
975	**60**	6	11	17	22	28	4	8	12	16	20	**975**
1000	**63**	6	12	17	23	29	4	8	12	16	20	**1000**
		Wind from 03:00 Pluss Wind from 09:00 Minus					Wind from 01:30 and 04:30 Pluss Wind from 07:30 and 10:30 Minus					

WIND TABLE FOR G-22

7,62X 67 DM 121 VM (AC 51)

VO= 895 m/s

		2	4	6	8	10	2	4	6	8	10	
Range	**Clicks**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Mils**	**Range**
100	**5**	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100**
125	**6**	0,00	0,00	0,00	0,00	0,15	0,00	0,00	0,00	0,00	0,00	**125**
150	**7**	0,00	0,00	0,00	0,00	0,15	0,00	0,00	0,00	0,15	0,15	**150**
175	**8**	0,00	0,15	0,15	0,15	0,30	0,00	0,15	0,15	0,15	0,15	**175**
200	**9**	0,00	0,15	0,15	0,30	0,30	0,00	0,15	0,15	0,15	0,30	**200**
225	**10**	0,15	0,15	0,30	0,30	0,45	0,00	0,15	0,15	0,30	0,30	**225**
250	**12**	0,15	0,15	0,30	0,45	0,60	0,15	0,15	0,30	0,30	0,90	**250**
275	**13**	0,15	0,30	0,45	0,45	0,60	0,15	0,15	0,30	0,30	0,45	**275**
300	**14**	0,15	0,30	0,45	0,60	0,75	0,15	0,15	0,30	0,45	0,45	**300**
325	**15**	0,15	0,30	0,45	0,75	0,90	0,15	0,30	0,30	0,45	0,60	**325**
350	**16**	0,15	0,45	0,60	0,75	0,90	0,15	0,30	0,45	0,60	0,60	**350**
375	**18**	0,15	0,45	0,60	0,90	1,05	0,15	0,30	0,45	0,60	0,75	**375**
400	**19**	0,30	0,45	0,75	0,90	1,20	0,15	0,30	0,45	0,60	0,75	**400**
425	**20**	0,30	0,45	0,75	1,05	1,20	0,15	0,30	0,60	0,75	0,90	**425**
450	**22**	0,30	0,60	0,90	1,35	1,35	0,15	0,45	0,60	0,75	0,90	**450**
475	**23**	0,30	0,60	0,90	1,20	1,50	0,15	0,45	0,60	0,90	1,05	**475**
500	**25**	0,30	0,60	0,90	1,35	1,65	0,30	0,45	0,75	0,90	1,05	**500**
525	**26**	0,30	0,75	1,05	1,35	1,65	0,30	0,45	0,75	0,90	1,20	**525**
550	**28**	0,30	0,75	1,05	1,50	1,80	0,30	0,45	0,75	1,05	1,35	**550**
575	**29**	0,45	0,75	1,20	1,50	1,95	0,30	0,60	0,90	1,05	1,50	**575**
600	**31**	0,45	0,90	1,20	1,65	2,10	0,30	0,60	0,90	1,20	1,65	**600**
625	**32**	0,45	0,90	1,35	1,80	2,25	0,30	0,60	0,90	1,20	1,50	**625**
650	**34**	0,45	0,90	1,35	1,80	2,40	0,30	0,60	1,05	1,35	1,65	**650**
675	**36**	0,45	1,05	1,50	1,95	2,40	0,30	0,75	1,05	1,35	1,65	**675**
700	**37**	0,45	1,05	1,50	2,10	2,55	0,30	0,75	1,05	1,50	1,80	**700**
725	**39**	0,60	1,05	1,65	2,25	2,70	0,45	0,75	1,20	1,50	1,95	**725**
750	**41**	0,60	1,20	1,65	2,25	2,85	0,45	0,75	1,20	1,65	1,95	**750**
775	**42**	0,60	1,20	1,95	2,40	3,00	0,45	0,90	1,20	1,65	2,10	**775**
800	**45**	0,60	1,20	1,95	2,55	3,15	0,45	0,90	1,35	1,80	2,25	**800**
825	**47**	0,60	1,35	1,95	2,55	3,30	0,45	0,90	1,35	1,80	2,25	**825**
850	**49**	0,75	1,35	2,10	2,70	3,45	0,45	0,90	1,50	1,95	2,40	**850**
875	**51**	0,75	1,50	2,10	2,85	3,75	0,45	1,05	1,50	1,95	2,55	**875**
900	**53**	0,75	1,50	2,25	3,00	3,75	0,45	1,05	1,50	2,10	2,55	**900**
925	**56**	0,75	1,50	2,40	3,15	3,90	0,60	1,05	1,65	2,25	2,70	**925**
950	**58**	0,75	1,65	2,40	3,30	4,05	0,60	1,20	1,65	2,25	2,85	**950**
975	**60**	0,90	1,65	2,55	3,30	4,20	0,60	1,20	1,80	2,40	3,00	**975**
1000	**63**	0,90	1,80	2,55	3,45	4,35	0,60	1,20	1,80	2,40	3,00	**1000**
		Wind from 03:00 Pluss Wind from 09:00 Minus					Wind from 01:30 and 04:30 Pluss Wind from 07:30 and 10:30 Minus					

G-22 (m and cm)

How much does the scope move at what range with how many clicks?

Range m	1 click	2 click	3 click	4 click	5 click
100	1,5	3	4,5	6	7,5
200	3	6	9	12	15
300	4,5	9	13,5	18	22,5
400	6	12	18	24	30
500	7,5	15	22,5	30	37,5
600	9	18	27	36	45
700	10,5	21	31,5	42	52,5
800	12	24	36	48	60
900	13,5	27	40,5	54	67,5
1000	15	30	45	60	75

Fixed Scope Reference in cm for the AC 51 (13 g)

		Target Distance (m)																		
Scope set at (in meter)	Bulletspeed in m/sec	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**
100	840	0	-5	-14	-26	-43	-65	-91	-122	-159	-202	-251	-307	-371	-443	-523	-613	-714	-825	-949
200	786	7	5	0	-9	-23	-40	-63	-91	-124	-164	-210	-262	-323	-391	-468	-555	-652	-760	-880
300	735	14	17	15	10	0	-14	-33	-57	-87	-122	-164	-213	-270	-335	-408	-491	-584	-688	-804
400	685	23	29	32	30	25	15	0	-20	-45	-77	-115	-160	-212	-273	-342	-421	-509	-610	-722
500	637	32	43	50	53	52	47	36	21	0	-27	-60	-101	-148	-204	-269	-343	-428	-523	-631
600	591	42	58	70	78	82	82	77	66	50	28	0	-35	-78	-129	-189	-258	-337	-428	-530
700	547	53	74	92	106	116	121	121	116	106	90	67	37	0	-45	-99	-163	-237	-322	-419
800	505	65	93	117	137	153	164	171	172	168	158	141	118	87	48	0	-57	-125	-204	-295
900	466	79	114	145	172	195	213	226	235	238	234	225	208	184	152	111	61	0	-72	-156
1000	428	95	137	176	211	241	267	289	305	315	320	318	309	293	269	236	193	140	76	0

Fixed Scope Reference in mils for the AC 51 (13 g) - (For Hold-off use)

		Target Distance (m)																		
Scope set at (in meter)	Bulletspeed in m/sec	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**
100	840	0,00	-0,50	-1,40	-2,60	-4,30	-6,50	-9,10	-12,20	-15,90	-20,20	-25,10	-30,70	-37,10	-44,30	-52,30	-61,30	-71,40	-82,50	-94,90
200	786	0,35	0,25	0,00	-0,45	-1,15	-2,00	-3,15	-4,55	-6,20	-8,20	-10,50	-13,10	-16,15	-19,55	-23,40	-27,75	-32,60	-38,00	-44,00
300	735	0,47	0,57	0,50	0,33	0,00	-0,47	-1,10	-1,90	-2,90	-4,07	-5,47	-7,10	-9,00	-11,17	-13,60	-16,37	-19,47	-22,93	-26,80
400	685	0,58	0,73	0,80	0,75	0,63	0,38	0,00	-0,50	-1,13	-1,93	-2,88	-4,00	-5,30	-6,83	-8,55	-10,53	-12,73	-15,25	-18,05
500	637	0,64	0,86	1,00	1,06	1,04	0,94	0,72	0,42	0,00	-0,54	-1,20	-2,02	-2,96	-4,08	-5,38	-6,86	-8,56	-10,46	-12,62
600	591	0,70	0,97	1,17	1,30	1,37	1,37	1,28	1,10	0,83	0,47	0,00	-0,58	-1,30	-2,15	-3,15	-4,30	-5,62	-7,13	-8,83
700	547	0,76	1,06	1,31	1,51	1,66	1,73	1,73	1,66	1,51	1,29	0,96	0,53	0,00	-0,64	-1,41	-2,33	-3,39	-4,60	-5,99
800	505	0,81	1,16	1,46	1,71	1,91	2,05	2,14	2,15	2,10	1,98	1,76	1,48	1,09	0,60	0,00	-0,71	-1,56	-2,55	-3,69
900	466	0,88	1,27	1,61	1,91	2,17	2,37	2,51	2,61	2,64	2,60	2,50	2,31	2,04	1,69	1,23	0,68	0,00	-0,80	-1,73
1000	428	9,50	13,70	17,60	21,10	24,10	26,70	28,90	30,50	31,50	32,00	31,80	30,90	29,30	26,90	23,60	19,30	14,00	7,60	0,00

Target lead Quick reference AC 51 7,62 x 67 (G22)

hold of in mils

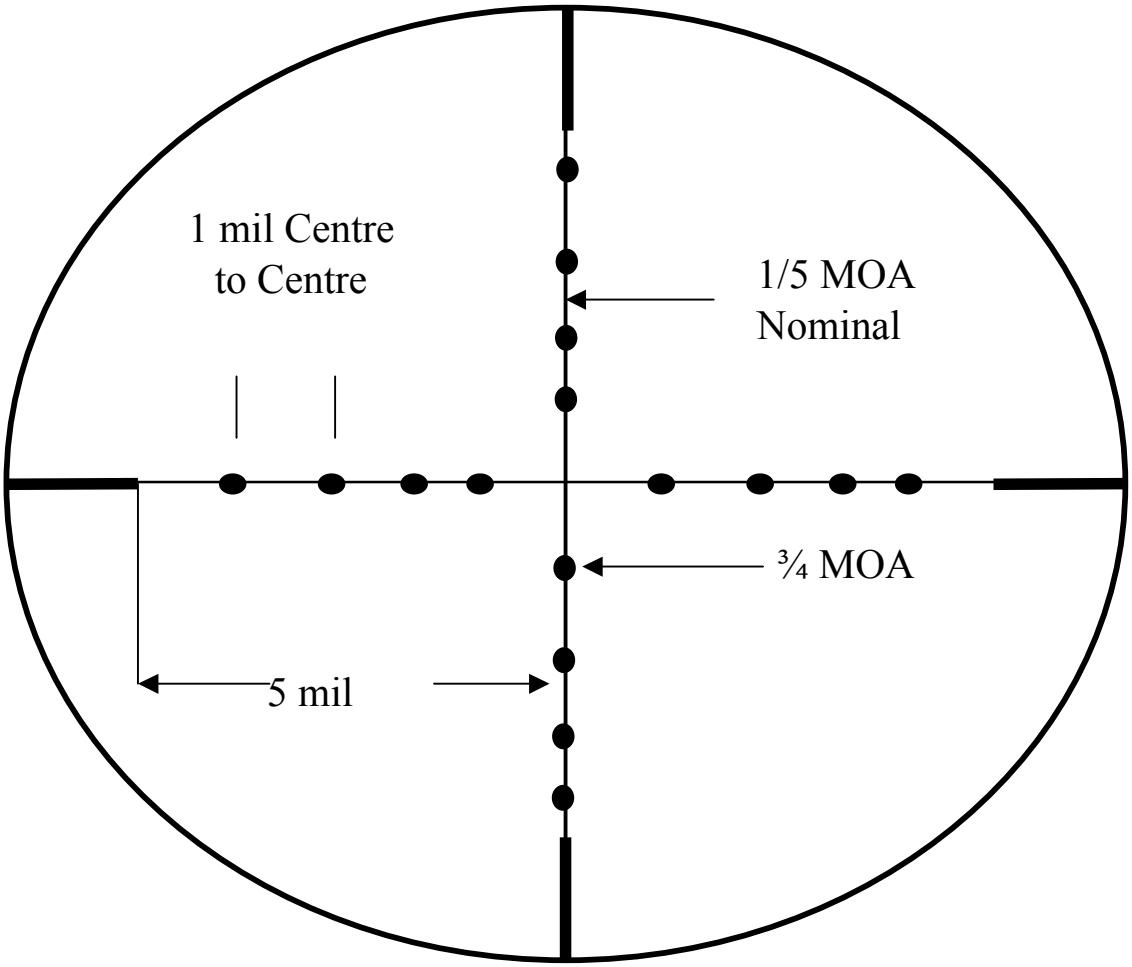
Range in m	Bullet time to flight m/sec	slow patrol	fast patrol	slow walk	fast walk	run
100	0,115	0,35	0,70	1,40	2,10	3,86
200	0,237	0,36	0,72	1,44	2,17	3,97
300	0,368	0,37	0,75	1,50	2,24	4,11
400	0,508	0,39	0,77	1,55	2,32	4,26
500	0,658	0,40	0,80	1,60	2,41	4,41
600	0,82	0,42	0,83	1,67	2,50	4,58
700	0,995	0,43	0,87	1,73	2,60	4,77
800	1,184	0,45	0,90	1,80	2,71	4,96
900	1,389	0,47	0,94	1,88	2,82	5,17
1000	1,611	0,49	0,98	1,96	2,95	5,40

Application of Fire - Slope Firing - G-22 300 WinMag

Compensation factors used when firing from a given angle

	Anglular Degree												
Percent of slope Angle Up or Down	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**
50	50,0	49,5	47,5	46,5	45,0	42,5	40,0	37,5	33,5	27,5	25,0	21,0	17,5
100	100,0	99,0	95,0	93,0	90,0	85,0	80,0	75,0	67,0	55,0	50,0	42,0	35,0
150	150,0	148,5	142,5	139,5	135,0	127,5	120,0	112,5	100,5	82,5	75,0	63,0	52,5
200	200,0	198,0	190,0	186,0	180,0	170,0	160,0	150,0	134,0	110,0	100,0	84,0	70,0
250	250,0	247,5	237,5	232,5	225,0	212,5	200,0	187,5	167,5	137,5	125,0	105,0	87,5
300	300,0	297,0	285,0	279,0	270,0	255,0	240,0	225,0	201,0	165,0	150,0	126,0	105,0
350	350,0	346,5	332,5	325,5	315,0	297,5	280,0	262,5	234,5	192,5	175,0	147,0	122,5
400	400,0	396,0	380,0	372,0	360,0	340,0	320,0	300,0	268,0	220,0	200,0	168,0	140,0
450	450,0	445,5	427,5	418,5	405,0	382,5	360,0	337,5	301,5	247,5	225,0	189,0	157,5
500	500,0	495,0	475,0	465,0	450,0	425,0	400,0	375,0	335,0	275,0	250,0	210,0	175,0
550	550,0	544,5	522,5	511,5	495,0	467,5	440,0	412,5	368,5	302,5	275,0	231,0	192,5
600	600,0	594,0	570,0	558,0	540,0	510,0	480,0	450,0	402,0	330,0	300,0	252,0	210,0
650	650,0	643,5	617,5	604,5	585,0	552,5	520,0	487,5	435,5	357,5	325,0	273,0	227,5
700	700,0	693,0	665,0	651,0	630,0	595,0	560,0	525,0	469,0	385,0	350,0	294,0	245,0
750	750,0	742,5	712,5	697,5	675,0	637,5	600,0	562,5	502,5	412,5	375,0	315,0	262,5
800	800,0	792,0	760,0	744,0	720,0	680,0	640,0	600,0	536,0	440,0	400,0	336,0	280,0
850	850,0	841,5	807,5	790,5	765,0	722,5	680,0	637,5	569,5	467,5	425,0	357,0	297,5
900	900,0	891,0	855,0	837,0	810,0	765,0	720,0	675,0	603,0	495,0	450,0	378,0	315,0
950	950,0	940,5	902,5	883,5	855,0	807,5	760,0	712,5	636,5	522,5	475,0	399,0	332,5
1000	1000,0	990,0	950,0	930,0	900,0	850,0	800,0	750,0	670,0	550,0	500,0	420,0	350,0
Multiple Range by	1,00	0,99	0,95	0,93	0,90	0,85	0,80	0,75	0,67	0,55	0,50	0,42	0,35

LEUPOLD & STEVENS M3A



1mil=3,375 MOA1MOA=0,3mils
¾ MOA=0,23mils

Fixed Scope Reference in Inches for the M118 Special Ball and M852 National Match (308)

		Target Distance (m)									
Scope set at (in meter)	Bulletspeed in m/sec	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**
100	741		-3	-13,5	-32	-60	-99	-150	-212	-293	-395
200	687	1,5		-9	-26	-52,5	-90	-140	-200	-279	-380
300	639	4,5	6		-14	-37,5	-72	-119	-176	-252	-350
400	591	8	13	10,5		-20	-51	-94,5	-148	-221	-315
500	549	12	21	22,5	16		-27	-66,5	-116	-186	-275
600	508	16,5	30	36	34	22,5		-35	-80	-144	-230
700	466	21,5	40	51	54	47,5	30		-40	-99	-180
800	433	26,5	50	66	74	72,5	60	35		-54	-130
900	401	32,5	62	84	98	102	96	77	48		-70
1000	370	39,5	76	105	126	138	138,6	126	104	63	

Windage Quick Reference US Ammo .308 (M-118LR 175g / M-118SB 173g)

Range in meter	Wind Value	3mph		5mph		7mph		10mph		12mph		15mph		18mph		20mph	
		1,3 m/sec		2,2 m/sec		3,1 m/sec		4,5 m/sec		5,4 m/sec		6,7 m/sec		8,1 m/sec		9 m/sec	
		cm.	IN	cm.	IN.	cm.	IN.	cm.	IN.	cm.	IN.	cm.	IN.	cm.	IN.	cm.	IN.
100	Half	0,40	0,16	0,67	0,27	0,94	0,37	1,35	0,53	1,62	0,64	2,02	0,80	2,42	0,95	2,69	1,06
	Full	0,81	0,32	1,35	0,53	1,89	0,74	2,69	1,06	3,23	1,27	4,04	1,59	4,85	1,91	5,39	2,12
200	Half	1,62	0,64	2,69	1,06	3,77	1,48	5,39	2,12	6,46	2,55	8,08	3,18	9,70	3,82	10,77	4,24
	Full	3,23	1,27	5,39	2,12	7,54	2,97	10,77	4,24	12,93	5,09	16,16	6,36	19,39	7,64	21,55	8,48
300	Half	3,64	1,43	6,06	2,39	8,48	3,34	12,12	4,77	14,55	5,73	18,18	7,16	21,82	8,59	24,24	9,54
	Full	7,27	2,86	12,12	4,77	16,97	6,68	24,24	9,54	29,09	11,45	36,36	14,32	43,64	17,18	48,48	19,09
400	Half	7,11	2,80	11,85	4,67	16,59	6,53	23,70	9,33	28,44	11,20	35,56	14,00	42,67	16,80	47,41	18,66
	Full	14,22	5,60	23,70	9,33	33,19	13,07	47,41	18,66	56,89	22,40	71,11	28,00	85,33	33,60	94,81	37,33
500	Half	11,11	4,37	18,52	7,29	25,93	10,21	37,04	14,58	44,44	17,50	55,56	21,87	66,67	26,25	74,07	29,16
	Full	22,22	8,75	37,04	14,58	51,85	20,41	61,73	24,30	88,89	35,00	111,11	43,74	133,33	52,49	148,15	58,33
600	Half	16,00	6,30	26,67	10,50	37,33	14,70	53,33	21,00	64,00	25,20	80,00	31,50	96,00	37,80	106,67	41,99
	Full	32,00	12,60	53,33	21,00	74,67	29,40	106,67	41,99	128,00	50,39	160,00	62,99	192,00	75,59	213,33	83,99
700	Half	21,78	8,57	36,30	14,29	50,81	20,01	72,59	28,58	87,11	34,30	108,89	42,87	130,67	51,44	145,19	57,16
	Full	43,56	17,15	72,59	28,58	101,63	40,01	145,19	57,16	174,22	68,59	217,78	85,74	261,33	102,89	290,37	114,32
800	Half	35,56	14,00	59,26	23,33	82,96	32,66	118,52	46,66	142,22	55,99	177,78	69,99	213,33	83,99	237,04	93,32
	Full	71,11	28,00	118,52	46,66	165,93	65,33	237,04	93,32	284,44	111,99	355,56	139,98	426,67	167,98	474,07	186,64
900	Half	45,00	17,72	75,00	29,53	105,00	41,34	150,00	59,06	180,00	70,87	225,00	88,58	270,00	106,30	300,00	118,11
	Full	90,00	35,43	150,00	59,06	210,00	82,68	300,00	118,11	360,00	141,73	450,00	177,17	540,00	212,60	600,00	236,22
1000	Half	55,56	21,87	92,59	36,45	129,63	51,04	185,19	72,91	222,22	87,49	277,78	109,36	333,33	131,23	370,37	145,81
	Full	111,11	43,74	185,19	72,91	259,26	102,07	370,37	145,81	444,44	174,98	555,56	218,72	666,67	262,47	740,74	291,63

Windage Quick Reference US Ammo .308 (M-118LR 175g / M-118SB 173g)

Range in meter	Wind Value	3mph		5mph		7mph		10mph		12mph		15mph		18mph		20mph	
		1,3 m/sec		2,2 m/sec		3,1 m/sec		4,5 m/sec		5,4 m/sec		6,7 m/sec		8,1 m/sec		9 m/sec	
		MOA	Mils	MOA	Mils	MOA	Mils	MOA	Mils	MOA	Mils	MOA	Mils	MOA	Mils	MOA	Mils
100	Half	0,14	0,04	0,23	0,07	0,32	0,09	0,45	0,13	0,55	0,16	0,68	0,20	0,82	0,24	0,91	0,27
	Full	0,27	0,08	0,45	0,13	0,64	0,19	0,91	0,27	1,09	0,32	1,36	0,40	1,64	0,48	1,82	0,54
200	Half	0,27	0,08	0,45	0,13	0,64	0,19	0,91	0,27	1,09	0,32	1,36	0,40	1,64	0,48	1,82	0,54
	Full	0,55	0,16	0,91	0,27	1,27	0,38	1,82	0,54	2,18	0,65	2,73	0,81	3,27	0,97	3,64	1,08
300	Half	0,41	0,12	0,68	0,20	0,95	0,28	1,36	0,40	1,64	0,48	2,05	0,61	2,45	0,73	2,73	0,81
	Full	0,82	0,24	1,36	0,40	1,91	0,57	2,73	0,81	3,27	0,97	4,09	1,21	4,91	1,45	5,45	1,62
400	Half	0,60	0,18	1,00	0,30	1,40	0,41	2,00	0,59	2,40	0,71	3,00	0,89	3,60	1,07	4,00	1,19
	Full	1,20	0,36	2,00	0,59	2,80	0,83	4,00	1,19	4,80	1,42	6,00	1,78	7,20	2,13	8,00	2,37
500	Half	0,75	0,22	1,25	0,37	1,75	0,52	2,50	0,74	3,00	0,89	3,75	1,11	4,50	1,33	5,00	1,48
	Full	1,50	0,44	2,50	0,74	3,50	1,04	4,17	1,23	6,00	1,78	7,50	2,22	9,00	2,67	10,00	2,96
600	Half	0,90	0,27	1,50	0,44	2,10	0,62	3,00	0,89	3,60	1,07	4,50	1,33	5,40	1,60	6,00	1,78
	Full	1,80	0,53	3,00	0,89	4,20	1,24	6,00	1,78	7,20	2,13	9,00	2,67	10,80	3,20	12,00	3,56
700	Half	1,05	0,31	1,75	0,52	2,45	0,73	3,50	1,04	4,20	1,24	5,25	1,56	6,30	1,87	7,00	2,07
	Full	2,10	0,62	3,50	1,04	4,90	1,45	7,00	2,07	8,40	2,49	10,50	3,11	12,60	3,73	14,00	4,15
800	Half	1,50	0,44	2,50	0,74	3,50	1,04	5,00	1,48	6,00	1,78	7,50	2,22	9,00	2,67	10,00	2,96
	Full	3,00	0,89	5,00	1,48	7,00	2,07	10,00	2,96	12,00	3,56	15,00	4,44	18,00	5,33	20,00	5,93
900	Half	1,69	0,50	2,81	0,83	3,94	1,17	5,63	1,67	6,75	2,00	8,44	2,50	10,13	3,00	11,25	3,33
	Full	3,38	1,00	5,63	1,67	7,88	2,33	11,25	3,33	13,50	4,00	16,88	5,00	20,25	6,00	22,50	6,67
1000	Half	1,88	0,56	3,13	0,93	4,38	1,30	6,25	1,85	7,50	2,22	9,38	2,78	11,25	3,33	12,50	3,70
	Full	3,75	1,11	6,25	1,85	8,75	2,59	12,50	3,70	15,00	4,44	18,75	5,56	22,50	6,67	25,00	7,41

Application of Fire - Slope Firing - US Ammo .308 M-118

Compensation factors used when firing from a given angle

	Angular Degree																	
Percent of slope Angle Up or Down (m)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**
50	49,5	49,0	48,0	47,0	45,5	43,5	41,0	38,5	35,0	32,0	28,5	25,0	21,0	17,0	13,0	8,5	4,5	0,0
100	99,0	98,0	96,0	94,0	91,0	87,0	82,0	77,0	70,0	64,0	57,0	50,0	42,0	34,0	26,0	17,0	9,0	0,0
150	148,5	147,0	144,0	141,0	136,5	130,5	123,0	115,5	105,0	96,0	85,5	75,0	63,0	51,0	39,0	25,5	13,5	0,0
200	198,0	196,0	192,0	188,0	182,0	174,0	164,0	154,0	140,0	128,0	114,0	100,0	84,0	68,0	52,0	34,0	18,0	0,0
250	247,5	245,0	240,0	235,0	227,5	217,5	205,0	192,5	175,0	160,0	142,5	125,0	105,0	85,0	65,0	42,5	22,5	0,0
300	297,0	294,0	288,0	282,0	273,0	261,0	246,0	231,0	210,0	192,0	171,0	150,0	126,0	102,0	78,0	51,0	27,0	0,0
350	346,5	343,0	336,0	329,0	318,5	304,5	287,0	269,5	245,0	224,0	199,5	175,0	147,0	119,0	91,0	59,5	31,5	0,0
400	396,0	392,0	384,0	376,0	364,0	348,0	328,0	308,0	280,0	256,0	228,0	200,0	168,0	136,0	104,0	68,0	36,0	0,0
450	445,5	441,0	432,0	423,0	409,5	391,5	369,0	346,5	315,0	288,0	256,5	225,0	189,0	153,0	117,0	76,5	40,5	0,0
500	495,0	490,0	480,0	470,0	455,0	435,0	410,0	385,0	350,0	320,0	285,0	250,0	210,0	170,0	130,0	85,0	45,0	0,0
550	544,5	539,0	528,0	517,0	500,5	478,5	451,0	423,5	385,0	352,0	313,5	275,0	231,0	187,0	143,0	93,5	49,5	0,0
600	594,0	588,0	576,0	564,0	546,0	522,0	492,0	462,0	420,0	384,0	342,0	300,0	252,0	204,0	156,0	102,0	54,0	0,0
650	643,5	637,0	624,0	611,0	591,5	565,5	533,0	500,5	455,0	416,0	370,5	325,0	273,0	221,0	169,0	110,5	58,5	0,0
700	693,0	686,0	672,0	658,0	637,0	609,0	574,0	539,0	490,0	448,0	399,0	350,0	294,0	238,0	182,0	119,0	63,0	0,0
750	742,5	735,0	720,0	705,0	682,5	652,5	615,0	577,5	525,0	480,0	427,5	375,0	315,0	255,0	195,0	127,5	67,5	0,0
800	792,0	784,0	768,0	752,0	728,0	696,0	656,0	616,0	560,0	512,0	456,0	400,0	336,0	272,0	208,0	136,0	72,0	0,0
850	841,5	833,0	816,0	799,0	773,5	739,5	697,0	654,5	595,0	544,0	484,5	425,0	357,0	289,0	221,0	144,5	76,5	0,0
900	891,0	882,0	864,0	846,0	819,0	783,0	738,0	693,0	630,0	576,0	513,0	450,0	378,0	306,0	234,0	153,0	81,0	0,0
950	940,5	931,0	912,0	893,0	864,5	826,5	779,0	731,5	665,0	608,0	541,5	475,0	399,0	323,0	247,0	161,5	85,5	0,0
1000	990,0	980,0	960,0	940,0	910,0	870,0	820,0	770,0	700,0	640,0	570,0	500,0	420,0	340,0	260,0	170,0	90,0	0,0
Multiple Range by	0,99	0,98	0,96	0,94	0,91	0,87	0,82	0,77	0,70	0,64	0,57	0,50	0,42	0,34	0,26	0,17	0,09	0,00

Fixed Scope Reference in cm for the M118 Special Ball and M852 National Match (308)

		Target Distance (m)									
Scope set at (in meter)	Bulletspeed in m/sec	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**
100	741	0,0	-7,6	-34,3	-81,3	-152,4	-251,5	-381,0	-538,5	-744,2	-1003,3
200	687	3,8	0,0	-22,9	-66,0	-133,4	-228,6	-355,6	-508,0	-708,7	-965,2
300	639	11,4	15,2	0,0	-35,6	-95,3	-182,9	-302,3	-447,0	-640,1	-889,0
400	591	20,3	33,0	26,7	0,0	-50,8	-129,5	-240,0	-375,9	-561,3	-800,1
500	549	30,5	53,3	57,2	40,6	0,0	-68,6	-168,9	-294,6	-472,4	-698,5
600	508	41,9	76,2	91,4	86,4	57,2	0,0	-88,9	-203,2	-365,8	-584,2
700	466	54,6	101,6	129,5	137,2	120,7	76,2	0,0	-101,6	-251,5	-457,2
800	433	67,3	127,0	167,6	188,0	184,2	152,4	88,9	0,0	-137,2	-330,2
900	401	82,6	157,5	213,4	248,9	259,1	243,8	195,6	121,9	0,0	-177,8
1000	370	100,3	193,0	266,7	320,0	350,5	352,0	320,0	264,2	160,0	0,0

Fixed Scope Reference in mils for the M118 Special Ball and M852 National Match(308)-(For Hold-off use)

		Target Distance (m)									
Scope set at (in meter)	Bulletspeed in m/sec	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**
100	741	0,0	-0,8	-3,4	-8,1	-15,2	-25,1	-38,1	-53,8	-74,4	-100,3
200	687	0,2	0,0	-1,1	-3,3	-6,7	-11,4	-17,8	-25,4	-35,4	-48,3
300	639	0,4	0,5	0,0	-1,2	-3,2	-6,1	-10,1	-14,9	-21,3	-29,6
400	591	0,5	0,8	0,7	0,0	-1,3	-3,2	-6,0	-9,4	-14,0	-20,0
500	549	0,6	1,1	1,1	0,8	0,0	-1,4	-3,4	-5,9	-9,4	-14,0
600	508	0,7	1,3	1,5	1,4	1,0	0,0	-1,5	-3,4	-6,1	-9,7
700	466	0,8	1,5	1,9	2,0	1,7	1,1	0,0	-1,5	-3,6	-6,5
800	433	0,8	1,6	2,1	2,3	2,3	1,9	1,1	0,0	-1,7	-4,1
900	401	0,9	1,7	2,4	2,8	2,9	2,7	2,2	1,4	0,0	-2,0
1000	370	10,0	19,3	26,7	32,0	35,1	35,2	32,0	26,4	16,0	0,0

Part 21

Range Cards

How to use your range card

Put im Corecct Elevation and Windage

Fill in administrativ data, as more details as better

ZERO TARGET

RANGE	DATE	TIME	RIFLE AND SCOPE		CORRECT ELEVATION	CORRECT WINDAGE	REMARKS
3a	*20.03.2003*	***10.30-11.15***	*G22 Nr.426 Scope Nr.321*		**100 m / 6 klicks**	**0**	
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
AC 51	*Vo 985*	*8*	*987hPa*	*978m*			

WIND		LIGHT
SPEED ***1 m/ sec***	DIRECTION	*Dull and lt. Overcast*
MIRAGE		Angle: ***18***

SHOT	1	2	3	4	5
ELEV	*5*	*6*	*6*	*6*	*6*
WIND	*0*	*0*	*0*	*0*	*0*
CALL	***Center, good controll***	***Center, good controll***	***right, pushed trigger***	***Missed, jerking the trigger***	***Center, good controll***

Report Windage direction and mirage if seen

Report light data and direction (incl angle)

Report elevation and windage used for each shot. Make changes as they occur

Plot in every Shot accurate with a dot or an X and put acording number as well

Report how the Shot was with possibl reason

Weapon Shooting Data

Weapon Nr. ***Optic type and Nr.***

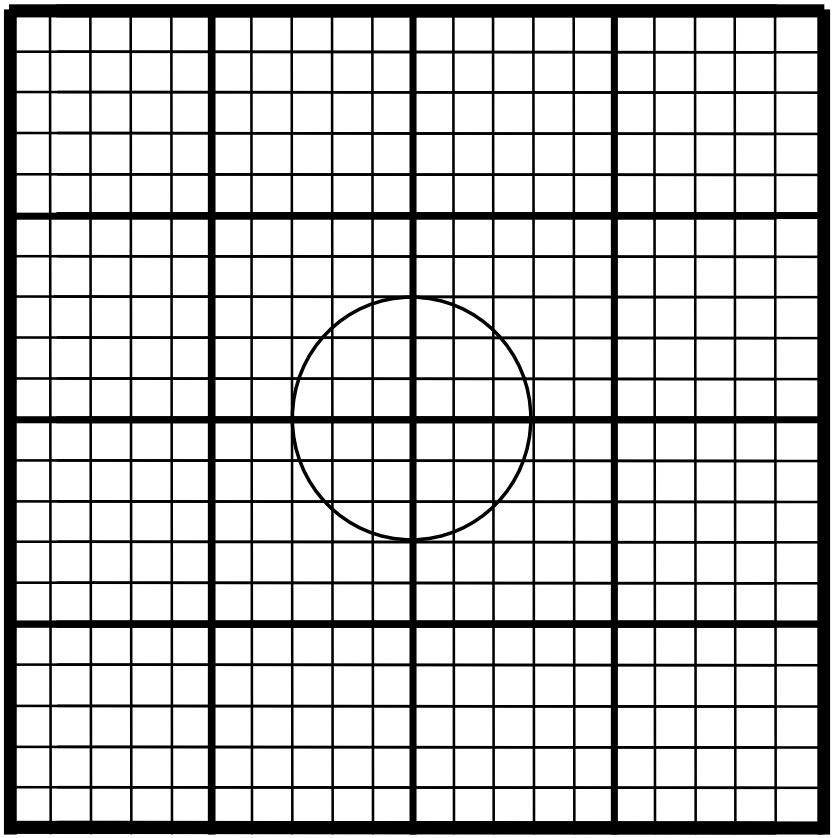
Elevation	Clicks	Windage	Speed	Direction	Temperature	Altitude	Position	Ammo Vo	Remarks
100	***9***	***0***	***1 m/s***	***12***	***20***	***684***	***Prone supported***	***895***	
100									
200									
300									
400									
500									
600									
700									
800									
900									
1000									

ZERO TARGET

RANGE	DATE	TIME	RIFLE AND SCOPE		CORRECT ELEVATION	CORRECT WINDAGE	REMARKS
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			

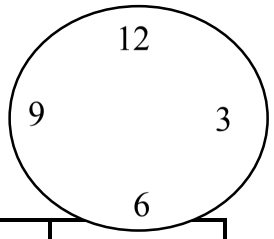
WIND		LIGHT
SPEED	DIRECTION	
	12 / 9 / 3 / 6	
MIRAGE		Angle:

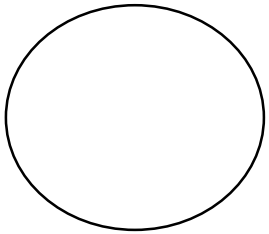
SHOT	1	2	3	4	5
ELEV					
WIND					
C A L L					



COLD BORE TARGET I

RANGE	DATE	TIME	RIFLE AND SCOPE		HOLD	CORRECT ELEVATION	CORRECT WINDAGE
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
WIND			LIGHT				
SPEED		DIRECTION					
MIRAGE							
SHOT	1	2	NOTES				
ELEV							
WIND							
C A L L							



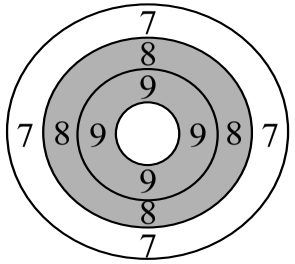
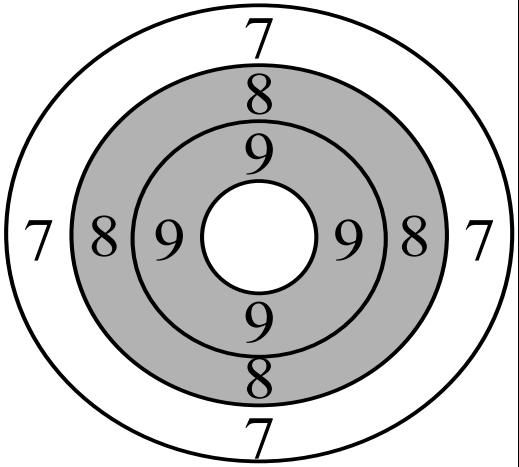
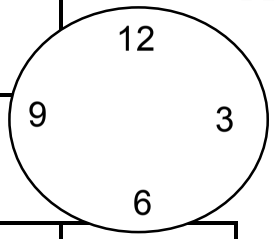
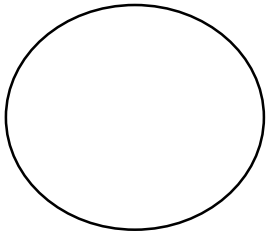


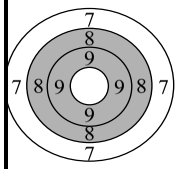
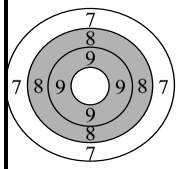
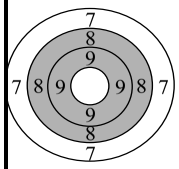
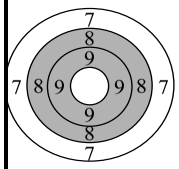
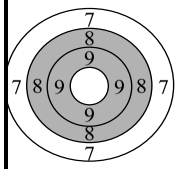
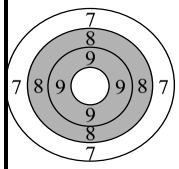
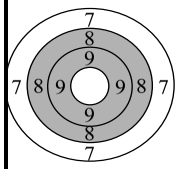
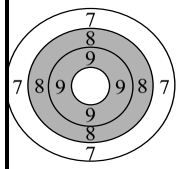
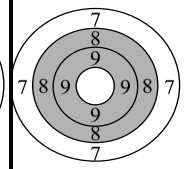
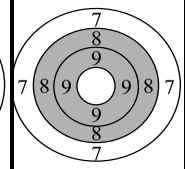
Cold Bore Shoot

Weapon Nr. ***Optic type and Nr.***

Elevation	*Clicks*	*Windage*	*Speed*	*Direction*	*Temperature*	*Result*	*Altitude*	*Position*	*Ammo Vo*	*Remarks*
200	***9***	***0***	***1 m/s***	***12***	***12***	***H 10 / R 5***	***684***	***Prone supported***	***895***	*Early in the morning, high humidity*

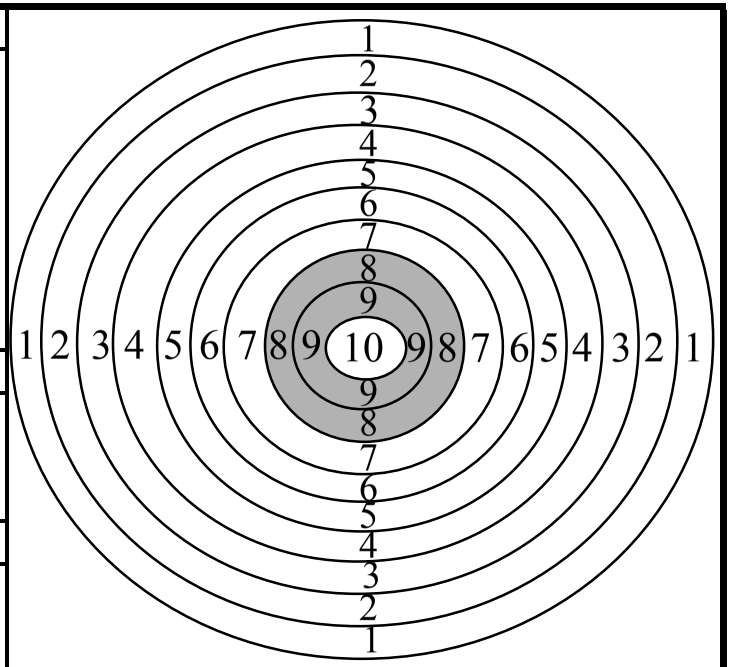
10 Ring 7 - 10

RANGE	DATE	TIME	RIFLE AND SCOPE		Hold		REMARKS
							
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
WIND			LIGHT				
SPEED		DIRECTION			CORRECT ELEVATION		
							
MIRAGE			Angle:		CORRECT WINDAGE		

SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
WIND										
CALL										

10 Ring

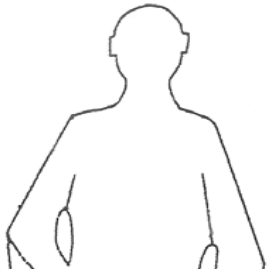
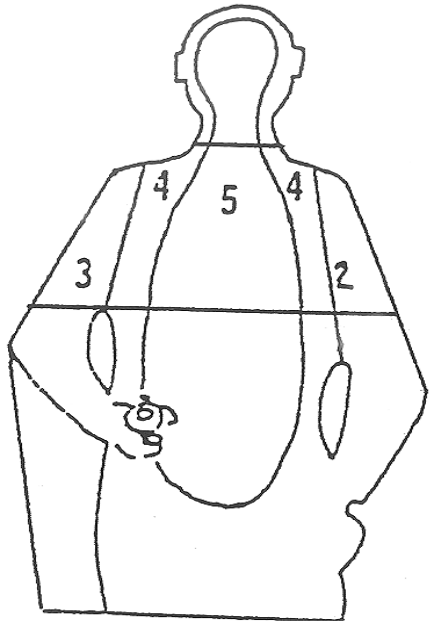
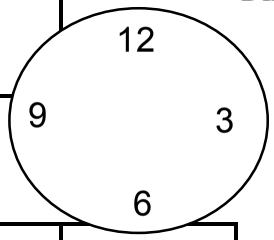
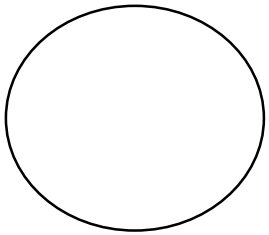
RANGE	DATE	TIME	RIFLE AND SCOPE		Hold
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE	
WIND			LIGHT		
SPEED		DIRECTION			CORRECT ELEVATION
MIRAGE			Angle:		CORRECT WINDAGE

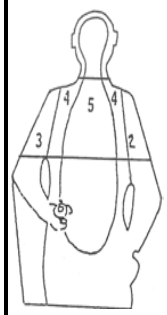
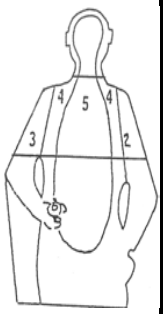
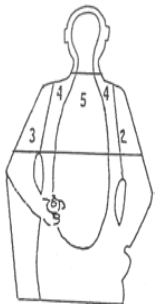
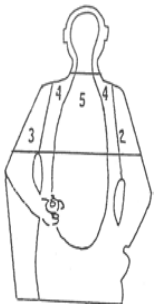
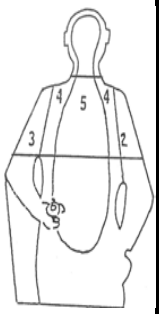
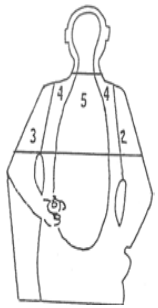
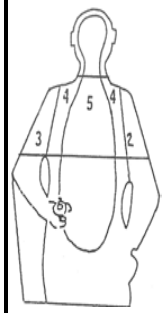
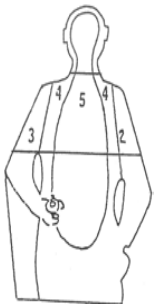
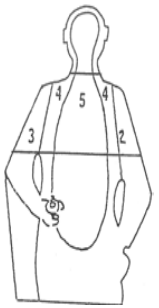
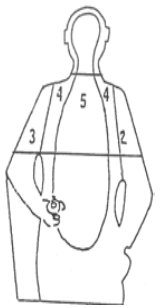


REMARKS

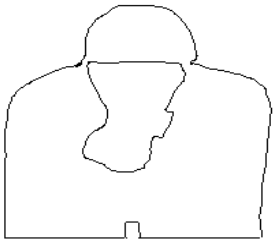
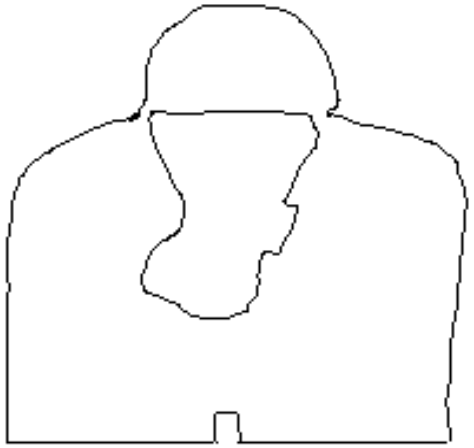
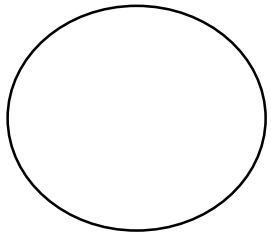
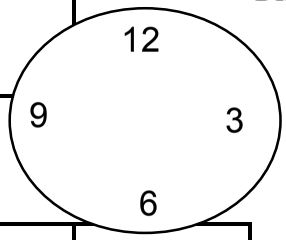
SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
WIND										
C A L L										

STATIONARY TARGET II "FBI"

RANGE	DATE	TIME	RIFLE AND SCOPE		Hold		REMARKS
							
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
WIND			LIGHT				
SPEED	DIRECTION				CORRECT ELEVATION		
							
MIRAGE			Angle:		CORRECT WINDAGE		

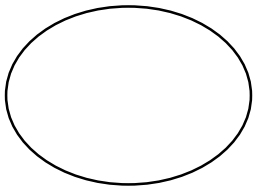
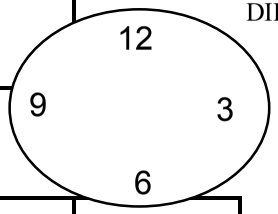
SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
WIND										
CALL										

Snaps GE Target

RANGE	DATE	TIME	RIFLE AND SCOPE		Hold	
						
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE		
WIND			LIGHT		Remarks	
SPEED		DIRECTION				
						
MIRAGE			Angle:			

SHOT	1	2	3	4	5	6	7	8	9	10
ELEV (Clicks)										
WIND										
C A L L										

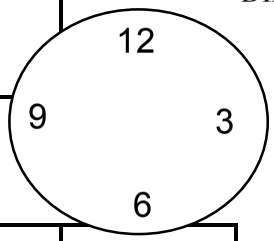
Moving Target

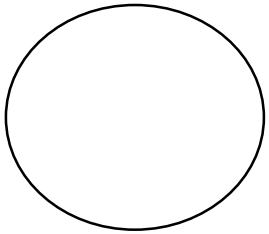
RANGE	DATE	TIME	RIFLE AND SCOPE		Hold		LEFT MIL LEAD	RIGHT MIL LEAD
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE				
WIND			LIGHT		CORRECT ELEVATION			
SPEED		DIRECTION						
					CORRECT WINDAGE			
MIRAGE			Angle:				Remarks	

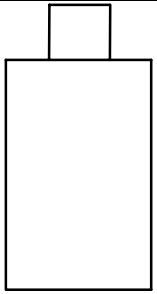
SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
WIND										
Hold of										
C A L L										

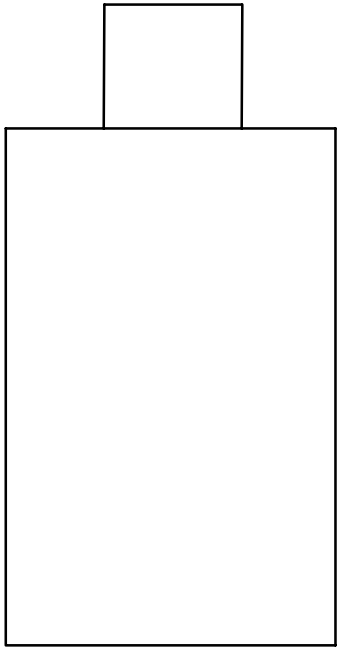
E Type

RANGE	DATE	TIME	RIFLE AND SCOPE		Hold		REMARKS
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
WIND			LIGHT				
SPEED	DIRECTION				CORRECT ELEVATION		
MIRAGE			Angle:		CORRECT WINDAGE		



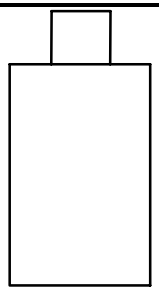
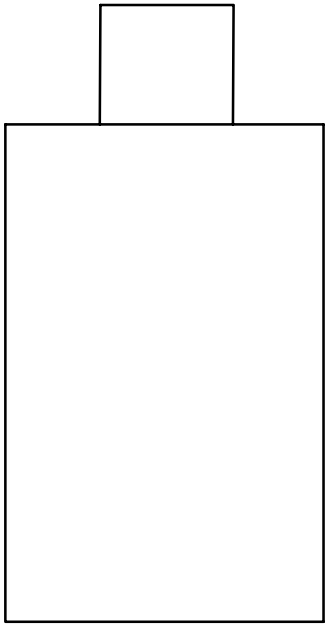
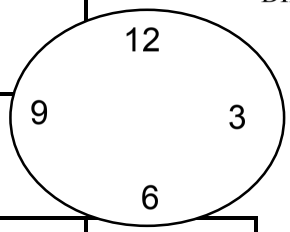
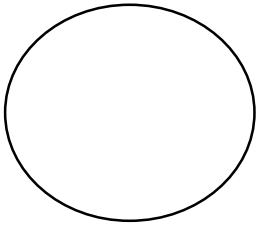


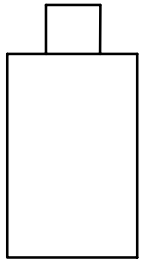
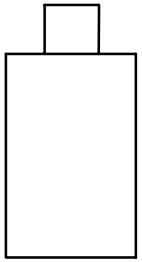
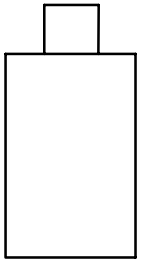
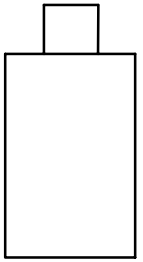
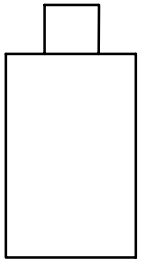
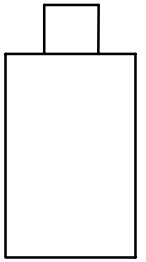
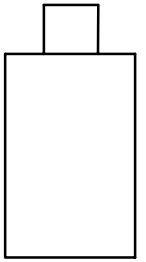
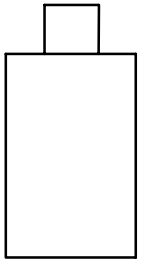
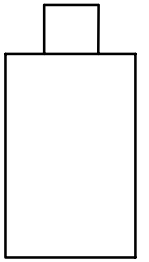
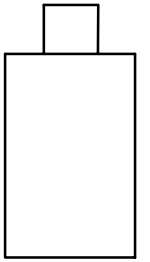




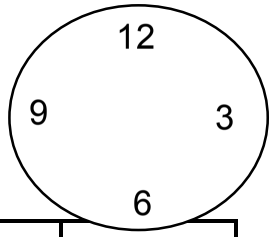
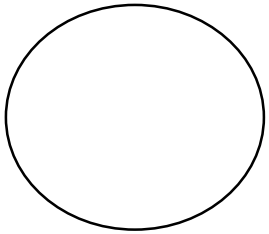
SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
WIND										
C A L L										

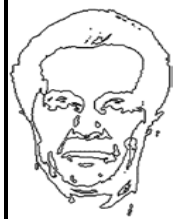
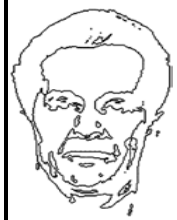
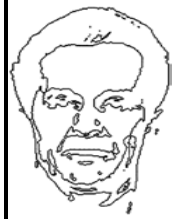
Fieldshooting E Type

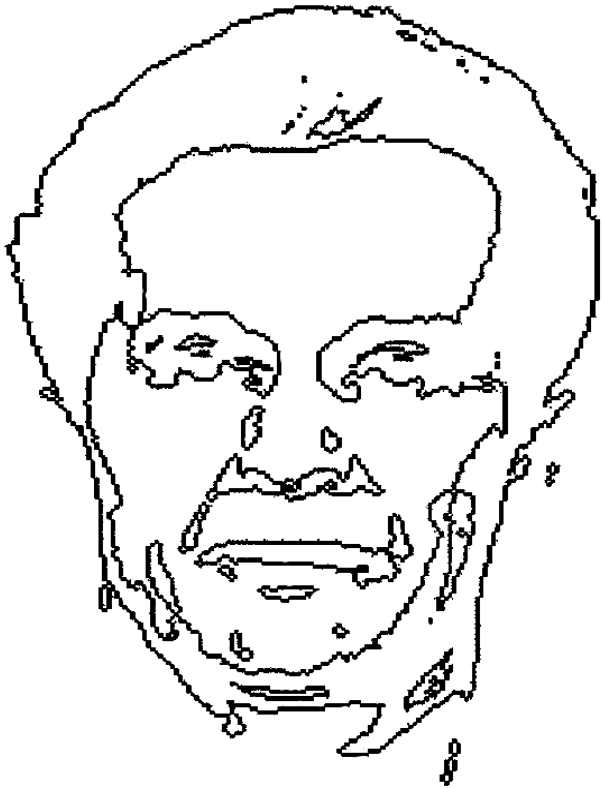
RANGE	DATE	TIME	RIFLE AND SCOPE		Hold	
						
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE		
WIND			LIGHT			
SPEED	DIRECTION				Remarks	
						
MIRAGE			Angle:			

SHOT	1	2	3	4	5	6	7	8	9	10
ELEV										
ELEV (Clicks)										
WIND										
C A L L										

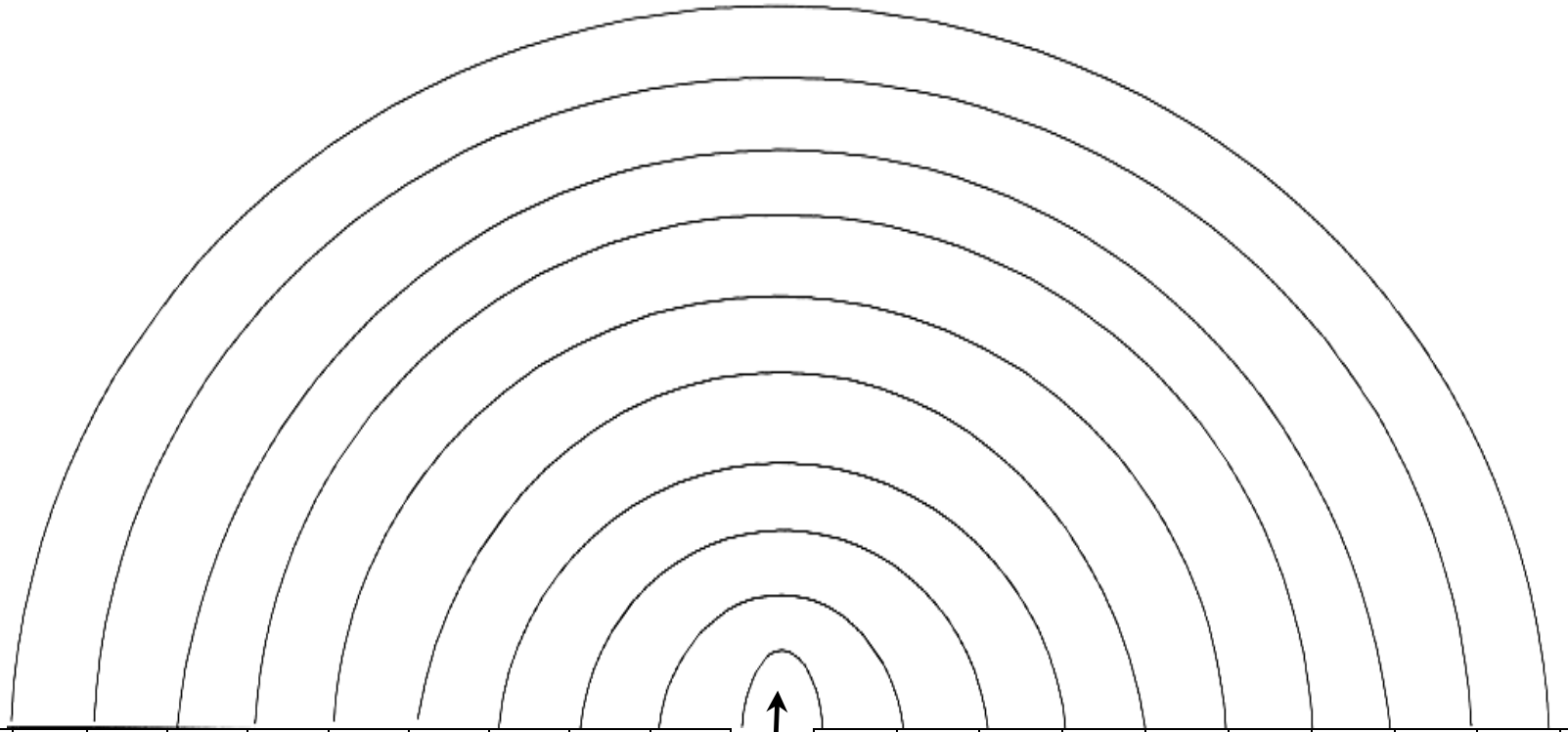
HEAD SHOT

RANGE	DATE	TIME	RIFLE AND SCOPE		HOLD	CORRECT ELEVATION	CORRECT WINDAGE
AMMO	LOT #	TEMP	HUMIDITY	ALTITUDE			
WIND			LIGHT				
SPEED  DIRECTION							
MIRAGE							

SHOT	1	2	3	4	5	REMARKS
ELEV						
WIND						
C A L L						



RANGE CARD



RANGE																				RANGE
ELEVATION																				ELEVATION
WINDAGE																				WINDAGE

TEMPERATURE		WIND	
HIGH	LOW	SPEED	DIRECTION

NOTES

ROUND COUNT

DATE	*ROUND TYPE*	*LOT NUMBER*	*NUMBER OF ROUNDS FIRED*	*TOTAL FIRED*	*DATE*	*ROUND TYPE*	*LOT NUMBER*	*NUMBER OF ROUNDS FIRED*	*TOTAL FIRED*
			TOTAL					TOTAL	

TOTAL ROUNDS THIS PAGE	
TOTAL ROUNDS PREVIOUS PAGE	
GRAND TOTAL	

SNIPER OBSERVATION LOG

SHEET OF

NAME DATE/TIME

LIGHT CONDITIONS VISIBILITY

NORTH

ITEM #	TIME	GRID LOCATION	OBSERVATION / EVENT	ACTIONS TAKEN